THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIII. No. 1624.] LONDON, JUNE 26, 1894. [46TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.

THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

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Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
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— ESTABLISHED 1830. —
PARKER & LESTER,
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THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
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WOLSTON'S
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Special Quotations to Gas Companies.
DARTMOUTH, DEVON.

THE "C" BURNER.
NEW HIGH-POWER GAS-LIGHT.
INCANDESCENT GAS-LIGHT SYSTEM.

Consumes 3¾ cubic feet per hour.

Gives a light of 70 to 80 candle power.

Brilliant Light.

Perfectly Steady and Noiseless.

Smokeless.

Reduced Heat.

The Ordinary Burner, with Special Globes, is suitable for Lighting Private Houses, Public Houses, Restaurants, Shops, &c.

Special Lamps constructed for Outside Lighting and Street Lighting; and Large Clusters of Lights made for Lighting Halls and large Areas from one centre.

Can be attached to any Gas-Fittings.

THE TRIUMPH OF GAS OVER ELECTRIC LIGHT.

Taking Gas at 3s. per 1000 cubic feet and Electric Light at 8d. per Board of Trade unit, the "C" Burner will produce an equal amount of light at **One-eighth the cost of Electric Light.** This cannot be disproved.

Substantial and Pushing Sole Agents wanted in each Town using Gas.

For Terms and Particulars, apply to the Manager of

THE INCANDESCENT GAS-LIGHT COMPANY, Ltd.,
14, PALMER STREET, WESTMINSTER, LONDON,
Near St. James's Park Station.

SAWER & PURVES, Garratt St. Works, MANCHESTER,

MANUFACTURERS OF

IMPROVED WET GAS-METERS IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

IMPROVED DRY GAS-METERS.

Speciality: PATENT CASH PREPAYMENT METERS.

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Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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FIRE BRICKS,

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Special Bricks for Intense Heats.

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CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

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Retort Setters sent to any part of the Kingdom.

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NEARLY

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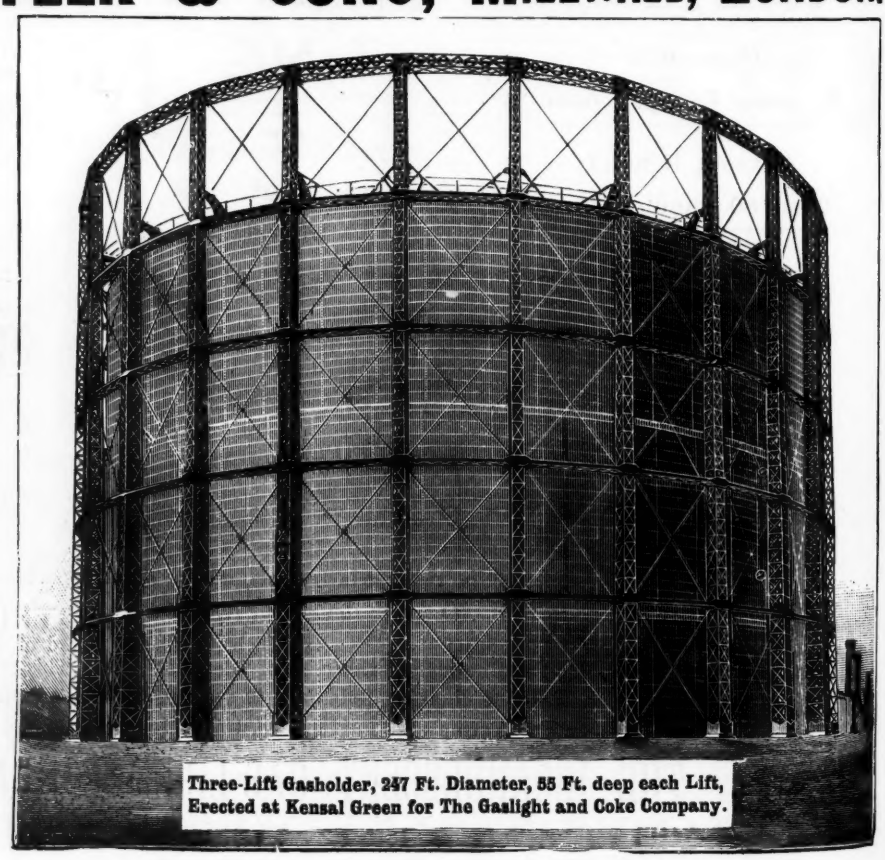
CUBIC FEET

CAPACITY.



Three-Lift Gasholder, 247 Ft. Diameter, 55 Ft. deep each Lift, Erected at Kensal Green for The Gaslight and Coke Company.

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GAS APPARATUS OF EVERY DESCRIPTION.

RETORTS, CONDENSERS, SCRUBBERS, PURIFIERS.

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BRIDGES, GIRDERS, WHARVES, PIERS.

ROOFING OF EVERY STYLE.

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GAS EXHAUSTING MACHINERY.

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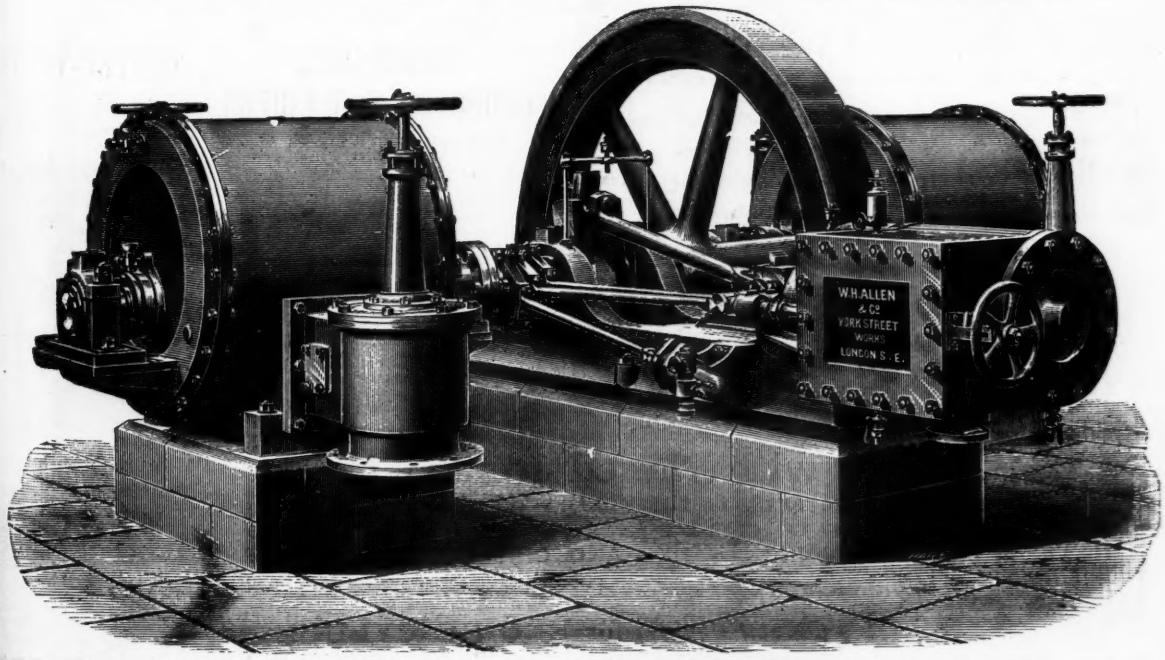

Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

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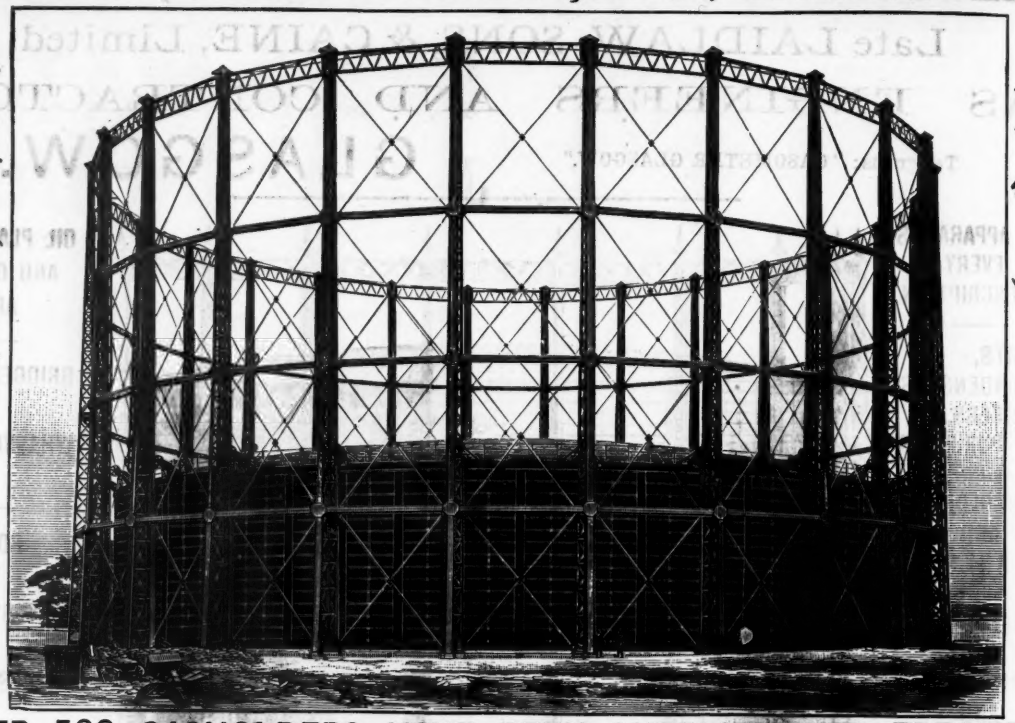

TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED FOUL PIPES, MAINS, RETORT-LIDS & CAST TANKS. PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

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REAL OLD SILKSTONE GAS COAL,

Address THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION OR Internal or External SCREWS of all sizes.

GASHOLDERS, AND Gasholder Tanks.

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RETORT-BED FITTINGS,

And Retort-House Appliances

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Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

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TAR AND LIQUOR PUMPS, &c.

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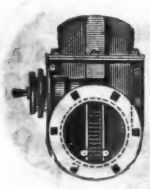
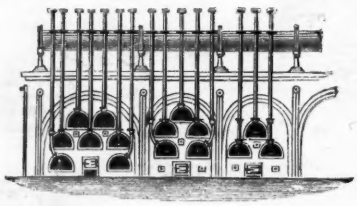
CENTRE-VALVES

for working Purifiers,

Also Bye-Pass & Stop Valves.



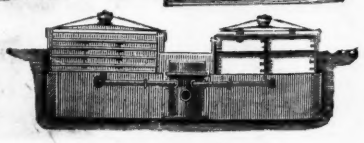


PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS.

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

JOSEPH CLIFF & SONS,

INCORPORATED IN THE LEEDS FIRE-CLAY COMPANY, Ltd.,

WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.

WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.

LIVERPOOL:
16, Lightbody Street.

LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

TELEGRAPHIC ADDRESS:
"ROBUSTNESS LONDON."

GAS & WATER WORK

J. & H. ROBUS,

ENGINEERS & CONTRACTORS,

20, BUCKLERSBURY, LONDON, E.C.,

furnish Plans, Estimates, and Specifications for SINKING BOREHOLES *and* WELLS; *Erecting* RESERVOIRS, FILTER-BEDS, *and* GASHOLDER TANKS; *and* EVERY REQUISITE *for* GAS *and* WATER WORKS,

INCLUDING

MAIN LAYING

EXCHANGE TELEPHONE 1756.

Wrought-Iron

And Fittings and Accessories.

LAMBERT BROS., WALSALL,

MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS GAS-VALVES, STEAM & WATER VALVES TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Short Street, LAMBETH.

OIL GAS

BETTER TERMS CAN BE OBTAINED FROM SUPPLIERS OF OIL IF PURCHASERS HAVE THEIR OWN

TANK-WAGGONS.

HURST, NELSON, & Co., LTD.,

THE GLASGOW ROLLING STOCK AND PLANT WORKS, MOTHERWELL.
REGISTERED OFFICE:
27, ST. VINCENT PLACE, GLASGOW.

CLAPHAM BROTHERS, LTD.,

— ESTABLISHED 1837 —

Sole Makers of Laycock and Clapham's

PATENT "ECLIPSE" WASHER-SCRUBBER.

Constructed on a **PRINCIPLE** which has **PROVED MOST EFFICIENT,** and **NOT REQUIRED IMPROVING,** giving the **LARGEST AMOUNT OF FRESHLY WETTED SURFACE** of any machine yet introduced.

68 Machines, with a total Capacity of 76,100,000 Cubic Feet per day, have been supplied, or are in course of erection.

Last year the Manchester Corporation put in an "ECLIPSE" WASHER-SCRUBBER to pass 3,000,000 Cubic Feet per day; and this year have ordered **TWO MORE, each to pass 4,000,000 Cubic Feet per day.**

OTHER LARGE REPEAT ORDERS HAVE ALSO BEEN RECEIVED.

CLAPHAM'S IMPROVED VALVES, PURIFIERS, AND RETORT-FITTINGS; MAINS, AND GENERAL CAST AND WROUGHT IRONWORK.

CATALOGUES AND FULL PARTICULARS ON APPLICATION.

Wellington, Nelson, and Market Street Works, KEIGHLEY, YORKS.

THE WHESSOE FOUNDRY CO., LTD., DARLINGTON.

Established 1790.

MANUFACTURERS OF EVERY DESCRIPTION OF GAS PLANT,

FROM

RETORTS

TO

GASHOLDERS,

FOR WHICH THEY HAVE THE NEWEST AND MOST MODERN MACHINERY.

GASHOLDERS CAN BE MADE OF ANY DIAMETER AND PUT TOGETHER AT THE WORKS.

Holders having a capacity of **7,000,000** Cubic Feet have been made and erected; the largest one being 181 feet diameter by 136 feet 9 inches deep. Riveted entirely with $\frac{3}{8}$-inch diameter Hot Rivets.

WE ERECT GASHOLDERS EITHER WITH OR WITHOUT FRAMING.
NO ROYALTIES TO PAY FOR SPIRAL GUIDES OR WIRE-ROPES.

SOLE MAKERS OF

COATES' IMPROVED PATENT FURNACE DOOR PROTECTOR

Which has been approved and adopted by the Gas Authorities at

SALFORD, MANCHESTER, BIRKENHEAD, STOCKTON, NEWCASTLE, DARLINGTON, &c.

Telegraphic Addresses: "WHESSOE, DARLINGTON." "WHESSOE, LONDON." | T. COATES, MANAGING DIRECTOR. | WORKS: DARLINGTON. LONDON OFFICE: 28, QUEEN STREET, E.C.

W. C. HOLMES & Co.

Purifier-Houses erected at Huddersfield to designs by Mr. W. R. HERRING.

Makers of Retort Ironwork, Condensers, Patent Scrubber-Washers, Purifiers, Gasholders of all sizes, and Gas Plant and Constructional Ironwork of every description.

Works: HUDDERSFIELD.

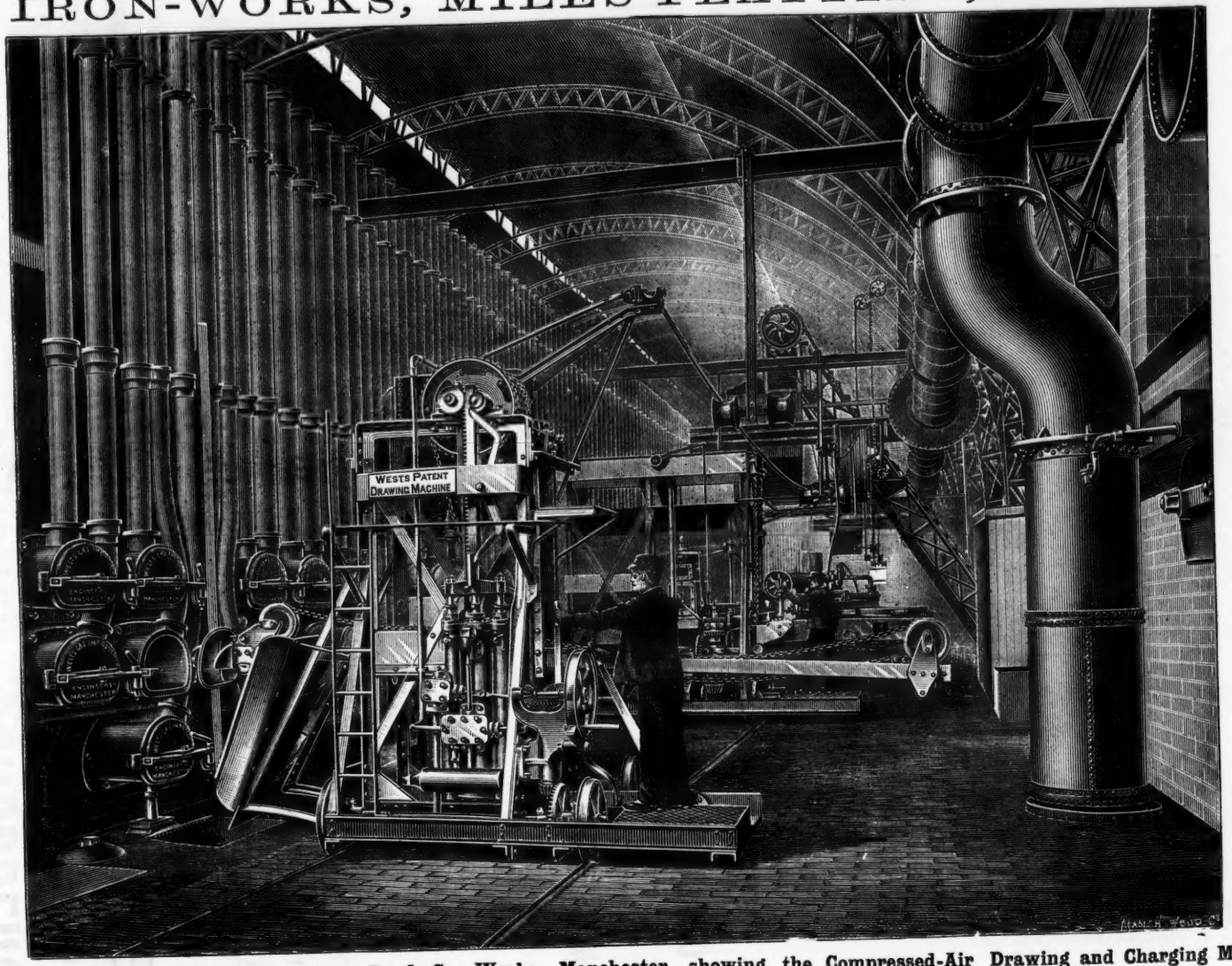
Telegrams: "Holmes, Huddersfield."

London Office: 80, CANNON ST., E.C. Telegrams: "IGNITOR."

WEST'S GAS IMPROVEMENT COMPANY, LTD.,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER.

WEST'S MANUAL AND POWER MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.



Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

OVER 560,000 LINEAL FEET OF RETORTS DAILY ARE CHARGED AND DRAWN BY WEST'S MACHINES.

KIRKHAM, HULETT, & CHANDLER'S,

PATENT LIMITED,

"STANDARD" WASHER-SCRUBBERS

These Machines are admittedly the most efficient of any in the Market, as evidence of which the fact is stated that 476 of them, equal to a daily capacity of 459,972,000 cubic feet of Gas, are in operation or in course of construction.

4 Machines, each for 3,500,000 cubic feet of Gas per day, erected at the Beckton Station of The Gaslight and Coke Company last year; 2 similar Machines erected at same Works this year.

Machines in hand for Silvertown, Devonport, Dorking, Accrington, Berlin, Marlborough (U.S.A.), &c.

ADDRESS:

3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

ASHMORE, BENSON, PEASE, & CO., LIMITED,

GAS-WORKS CONTRACTORS, STOCKTON-ON-TEES.

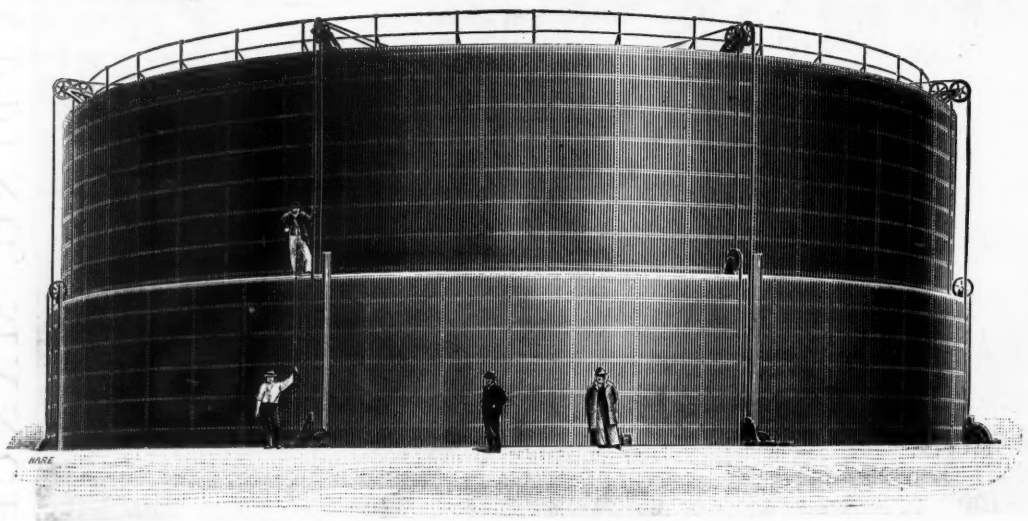


Illustration of BATHURST Holder, 82 feet diameter by 18 feet deep each Lift.

GASHOLDERS ON THE WIRE-ROPE SYSTEM

SUPPLIED TO THE FOLLOWING CORPORATIONS, COMPANIES, AND WORKS, AT

MANCHESTER (4 Holders).	HASLINGDEN.	HARROGATE.	BIRKENHEAD.
NOTTINGHAM (4 Holders).	DARLINGTON.	SHEFFIELD.	SLIGO.
BATHURST (AUSTRALIA).	PELTON.	SOUTHBOROUGH.	ST. AUSTELL,
HORSENS (DENMARK).	TYNE DOCK.	DENTON.	AND MANY OTHERS
MILAN (ITALY).	NEWBURN.	ASKE.	IN AMERICA.

LONDON OFFICE: 15, VICTORIA STREET, S.W.

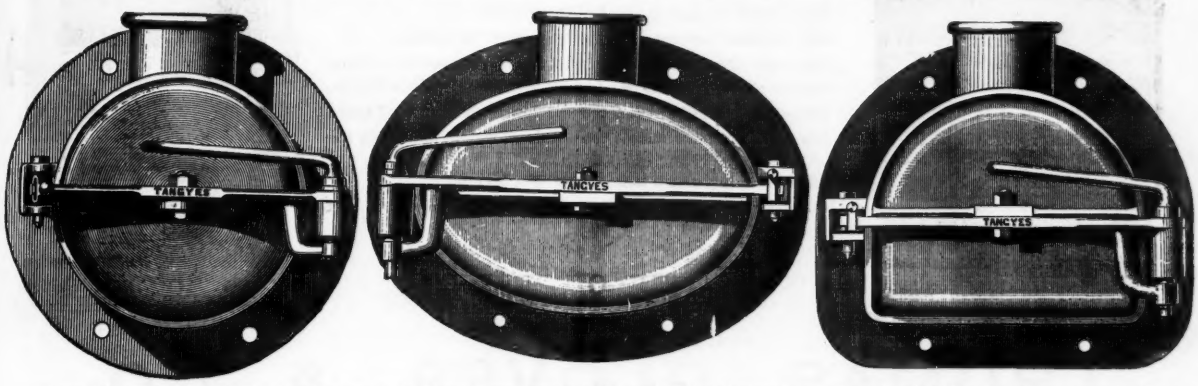
TANGYES LIMITED, CORNWALL WORKS, BIRMINGHAM;

AND AT

LONDON, NEWCASTLE, MANCHESTER, GLASGOW, SYDNEY, MELBOURNE, JOHANNESBURG, BILBAO, ROTTERDAM, & CALCUTTA.

MORTON'S SELF-SEALING RETORT-LID,

With Holman's Anti-Friction Catch, Self-Sustaining Cross-Bar, and Improved Eccentric Bolt.



These Retort Lids and Fastenings are made in three forms, round, oval, and ⌂ (as shown above), in each of which we have a very extensive variety of patterns, from which Gas Engineers contemplating the adoption of these Lids are recommended to make their selection, in order to avoid cost of pattern-making, delays, &c., &c.

QUOTATIONS WILL BE GIVEN ON RECEIPT OF PARTICULARS OF REQUIREMENTS.

LIST OF PATTERNS ON APPLICATION.

Telegrams: "TANGYES, BIRMINGHAM." No. 90 E.

"BEAR CREEK"

The best KENTUCKY CANNEL in the Market.

Capacity of Mine, 160,000 Tons per Annum. Surface Drift Vein, 50 Inches Thick (*No Partings*).

AREA (ALL OWNED BY THIS COMPANY) 5000 TO 7000 ACRES (6000 TONS PER ACRE).

SAMPLE CARGO will demonstrate the extraordinary value of this Coal, and of the resultant Coke and other Bye-Products.

The unlimited quantity and REDUCED PRICE of this Material makes it the most satisfactory and economical Gas Enricher now available

Result of Practical Working Test by Mr. John Methven, Engineer of The Gaslight and Coke Company, London, Aug. 8, 1893.

16·159 feet of 29·56 candles.
(484·770 candle-feet per 2240 lbs.)

Sperm Value	1638 lbs.
Specific Gravity	1200 (Water 1000)
Weight of 1 cubic foot	75 lbs.
Coke	944 lbs.
Carbon in Coke	80·83 per cent.
Ash „ „	18·43 per cent.

Remarks by Mr. Methven—

"Sample received representing full section of working in mine. The whole sample was broken up and well mixed; and the practical results obtained represent the mean of 18 experiments. *The general results may be considered reliable.* The above results stamp this Cannel as being one of the most valuable obtainable. Not only does it possess a high yield of very rich gas, but its production of coke is of large quantity, and of a quality rarely found in cannels producing such a rich volume of gas. The coke is eminently suitable for mixing with coke from common coal; its percentage of ash being remarkably low."

Result of Laboratory Test by Mr. George R. Hislop, Gas Engineer, Paisley Scotland, Oct. 26, 1893.

14·630 feet of 41·24 candles.
(603·488 candle-feet per 2240 lbs.)

Sperm Value	2069 lbs.
Specific Gravity	1152 (Water 1000)
Weight of 1 cubic foot	72 lbs.
Coke	994 lbs.
Carbon in Coke	92·30 per cent.
Ash „ „	7·70 per cent.

Remarks by Mr. Hislop—

"Very compact and cohesive, and uniform in composition and density. A cannel coal of exceptional value, and remarkable light-giving power and purity, affording a light and spongy coke of excellent quality. The Coal contains a very small percentage of both water and sulphur. Compared with Main Lesmahagow represented by 100, having regard to the value of the secondary products and cost of purification of the gas, this Coal is equal to 137·11."

COKE.—Briefly the "Bear Creek" Cannel produces a first-class Coke—that is, by itself, and unmixed with Coke from Common Coals—merchantable, comparing favourably with Coke from the Standard Gas Coals.

Correspondence solicited. Printed Reports, Analyses, and Letters of Commendation sent on application.

"BEAR-CREEK" CANNEL Mined and Owned by

The Log Mountain Coal, Coke, and Timber Company,

PINEVILLE, KENTUCKY, U.S.A.

Cable Address: "HULL, PINEVILLE" (A.B.C. Code.)

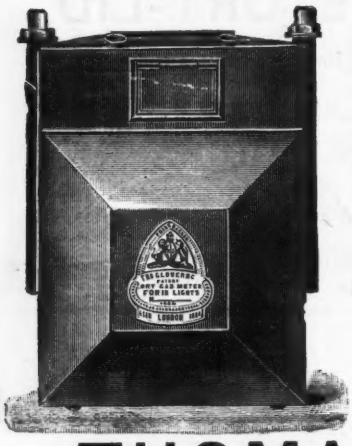
NOTE.—The President of the above Company (Mr. F. A. Hull) is now in Europe; and Letters or Telegrams addressed to him care of Low's Exchange, 57, Charing Cross, London, until July 11, will receive prompt attention.

[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.



1st.—Are a remedy for all the defects of Wet Meters.
2nd.—Are suitable for all Climates, whether hot or cold.
3rd.—Incur no loss of Gas by Evaporation.
4th.—Cannot become fixed by Frost, however severe.
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights.
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

Telegraphic Address: "GOTHIC LONDON."
Telephone No. 6725.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

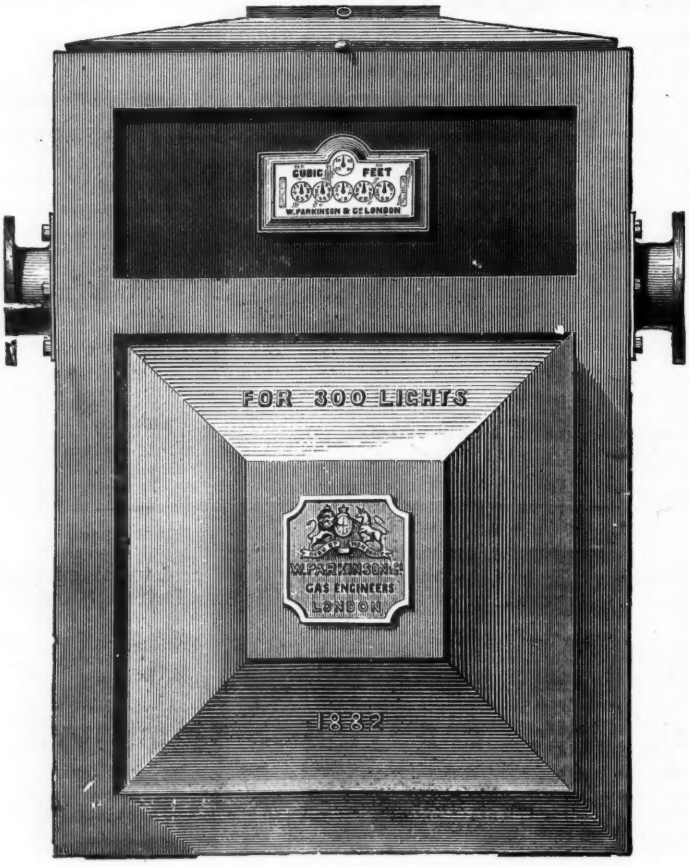
BRISTOL: 62, VICTORIA STREET. *Telegraphic Address*: "GOTHIC."

BIRMINGHAM: 3, BRIDGE ROW, DERITEND. *Telegraphic Address*: "GOTHIC."

LEEDS: BOAR LANE CHAMBERS, 4, BASINGHALL STREET. *Telegraphic Address*: "GOTHIC."

MANCHESTER: 87, BLACKFRIARS STREET. *Telegraphic Address*: "GOTHIC."

W. PARKINSON & Co.



MANUFACTURERS OF

DRY METERS

OF THE VERY BEST QUALITY.

The DIAPHRAGMS are of the Finest PERSIAN SHEEP SKINS.

The CASES are of the Best CHARCOAL-TINNED PLATES.

WET METERS,

With PATENT THREE-PARTITION DRUMS.

STATION METERS AND GOVERNORS.

PRESSURE & EXHAUST REGISTERS,

MOTIVE POWER METERS,

Test Gasholders, Experimental Apparatus, &c.

PRESSURE GAUGES OF EVERY DESCRIPTION.

NEW ILLUSTRATED CATALOGUE AND PRICE LIST

Sent post free on application.

COTTAGE LANE WORKS, CITY ROAD,

LONDON.

Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS, **BIRMINGHAM.** Telegraphic Address: "GAS METERS."

10, MAWSON'S CHAMBERS, DEANSGATE. **MANCHESTER.** Telegraphic Address: "PRECISION."

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 26, 1894.

The Meeting of the Incorporated Gas Institute.

THE meeting of the Incorporated Gas Institute last week must be recorded among the most successful in the annals of the association. The attendance was good; and it was maintained throughout the whole of the three days devoted to the business of the meeting in a manner that may be truthfully termed unprecedented. The number of papers read and discussed was large; and their quality ranged from fair to excellent. The discussions were, on the whole, lively and pointed; and, under the genial rule of Mr. West, the proceedings lacked nothing of dignity and enthusiasm for the Institute. Indeed, this latter virtue was carried almost to excess in one regard—leading several prominent members into an ebullition of resentment against the presumption of anybody inside or outside the Institute who should venture to remark that a single action of the Council is ill-advised. It is best not to dwell too much upon the existence in the Institute of this impatience of criticism, which may be expected to subside when the leading spirits of the organization feel more assured of the prospect of its continuing in prosperous existence. It should not endure for another day if the zealous individuals now referred to could only bring themselves to realize that in the JOURNAL—which is the only serious technical publication sufficiently interested in the fortunes of the association to print comments upon its proceedings for or against—there is to be found far more praise than blame for the doings of the governing body as a whole, and certainly no dispraise of a single personality connected with it. If a periodical were never to pass censure, for reasons given, upon a public body, the condition of the latter would certainly not be improved.

It is complained of the JOURNAL that our motive, even in calling in question small matters in regard to which opinions may differ, is jealousy of the very existence of the organization as at present constituted. Such, at any rate, is the avowed opinion of Mr. J. Hepworth, the Honorary Secretary of the Institute, whose observations, never made lightly, are always entitled to most respectful consideration. Mr. Hepworth seems to imply that our supposed jealousy of the Institute's prosperity is due to a predilection for the other general society of gas engineers—the Incorporated Institution. Well, in commenting upon this very Institution on May 15 last, we certainly made several remarks not couched in the language of adulation; and we are entitled to ask Mr. Hepworth and those members of the Institute who share his prejudice—for it is nothing more—in this regard, to set, in the spirit of fairness, these sweeping warnings against the small points of criticism which we have made against the last report of The Gas Institute Council.

It is desirable to straighten this matter out now, while last week's proceedings are fresh in the memory of those who took part in them, in order that no effort of ours may appear to be lacking in making good once more the old saying that "the falling out of faithful friends renewal is "of love." We have too many good friends in and out of both the Institute and the Institution to desire that any shadow of misunderstanding should persist between us and them in regard to their corporate interest in these organizations. There have been those who rejoiced in fomenting discord, and who sought to gain some advantage in creating and aggravating animosities and sectional dissensions. Of such individuals we take no heed. The personality of the gas industry suffered much from them; and it may suffer more. But this is a trouble not confined to the little world of gas engineers and managers; and we can address ourselves only to those of our readers who desire peace. If the reproach of jealousy is to apply to the JOURNAL, we admit the impeachment only as regards the interests of the gas industry at large and of its worthy followers. There is a sense in which we have been inclined to deprecate the existence both of the Institute and of the Institution; because, for obvious reasons, their co-existence is to be regretted. We have had hopes until quite recently that a means might be discovered of fusing these two bodies, which, as was admitted in these columns in the course of the article already quoted from, have identical missions. But it is now high time to recognize the vanity of all such aspirations. The unity of British gas engineers, as regards their national organization, is clearly as far beyond the scope of practical politics as the reunioin of Christendom. This central fact of the existing position being recognized, the only course for sensible people to follow is to make the best of it.

Let us hope, therefore, there may henceforward be no more invidious comparisons between the two associations; but let each do its work and justify its existence in its own way. The heads of both, however, must be content to have their corporate conduct criticized, without entertaining even a lurking suspicion of the good faith of the criticism, and, above all, without thinking that whatever is publicly said of their proceedings is meant to disparage them before the others. As in the great parallel case of Christendom, let it be understood that the members of

independent classifications make their election to one or the other from the motive that they can do more and better work in the particular environment of their ultimate choice. We have credited the Institution, for example, with having hitherto shown itself to be a more manageable and more businesslike body than the Institute; and the remark is just. Manageability is affected by numbers; and attention to business is, so to speak, the common virtue of young firms with their position to make. If the leaders of the Gas Institution were schismatics, they also possessed the enthusiasm and devotion belonging to the part; and they have done more on their own account during their independent corporate existence, as their valuable Transactions well testify, than they would in all probability have done for their old society. Yet some of them were ranked among the most fruitful workers in the Institute, which could but feel their loss acutely. Until this present year, the proceedings of the Institute meetings since the disruption have not been of an order that commanded entire respect by students of technology; and the best contributions to technical literature to be found in the annual volumes of Transactions published during this period were the work of professional men from outside. Meanwhile, the social side of the Institute gatherings has distinctly improved, as we have abundantly witnessed. But this year the Institute has nothing to be ashamed of in regard to the technical work of the meeting. The paper read by Mr. James Stelfox alone—far and away the best account that has ever been published of the important class of operations described in it—would redeem the character of the dullest gas managers' meeting; and there were others not far beneath it in interest. This is what technical societies live for, in addition to the promotion of intercommunication among the members—the collection, from sources not be tapped by other means, of information of sterling value, which is interesting in the first instance when given in open meeting, where every statement can be explained and mistakes corrected, if necessary, and which renders the printed record permanently valuable for reference. In this respect, the Institute this year has amply fulfilled its mission. So long as it or any other technical society does this, there is no fear of anybody decrying it as unfitted to live.

And now we trust that, having made matters clear between ourselves and the administration of the Institute—who are at liberty to regard this article as an *amende honorable* if they choose to do so—the painful part of the subject may be allowed to drop, never to be handled again. Let us, in closing this notice of the event of the past week, offer our sincerest congratulations to the President upon the success which it has been his privilege to aid in placing to the credit of the Institute, and to the readers of papers, the Executive Committee, Honorary Secretary, Secretary, and, in short, to all who in any way contributed to make this what the vernacular terms a "record" meeting—not excluding the Clerk of the Weather, who appeared to have reserved the inauguration of the summer for this occasion.

Mr. Livesey on the Profit-Sharing System.

THERE is something not very hopeful in the circumstance of our having to discuss profit-sharing in gas-works with Mr. George Livesey single-handed. As his letter in our "Correspondence" columns to-day witnesses, we are at one with him in desiring to see the system extended, if only by way of experiment in undertakings not carried on under sliding-scale conditions; but the evident reluctance of other responsible gas engineers and managers even to enter into a discussion on the subject looks bad for the prospects of the extension of the system in the immediate future. One obvious difficulty in the way of the introduction of any such method of paying for labour in gas-works is the fact that it means an addition to the existing wages. Otherwise the men to whom it would be offered would hardly see any advantage in entering into the new arrangement. Mr. Livesey says that additional pay coming to the men in this way is not really an extra charge on the working expenses of gas making, inasmuch as the men earn it, and more. All the same, this consideration does not do away with the initial difficulty already alluded to, which is likely to be acutely felt by Gas Committees of Corporations—that by countenancing any such scheme they would, in effect, be raising the wages of the already well-paid gas workers beyond the scale payable by other employers of the same class of labourers in the district. As Mr. Livesey has admitted on another occasion, there is no record of an advance in the rate of pay of gas workers being afterwards taken away—a reflection which does not tend to lighten the responsibility of the gas-works administrators who might, upon general principles, be not unwilling to try an experiment in this regard. In reply to the gist of the second paragraph of Mr. Livesey's letter, we must not be understood as having hinted anywhere that the sliding-scale principle of gas-works administration has failed, or that anything better has yet been suggested for harmonizing the interests of gas suppliers and consumers. On the contrary, Mr. Livesey is fully justified in his contention that "it has "answered its purpose." But what we do say is that it is inconceivable that a gas company or a municipal committee whose relations with their consumers are not regulated in this way, would consent to import it into their relations with their workpeople for the sake of meeting a trouble of the existence of which they are not actually cognizant.

The fact of the matter is that Mr. Livesey, in crushing the fighting power of the Gas Workers' Union, did the work so thoroughly, that many of those employers who saw danger in the threatened supremacy of the Union are now contented to believe that all risk of the kind has passed away. They will admit that Mr. Livesey was a saviour of industrial society in a great emergency; but they believe he would have done just as well if he had not gone in for profit-sharing. We do not repeat this statement for the purpose of supporting it, but only in order to place upon record an impression we have received during much mingling with gas managers hailing from all parts of the kingdom. Mr. Livesey is the last man to be discouraged by finding that his policy does not instantly become the fashion; but it is right that he should be confronted with the reasons why his present policy in regard to the labour question in gas-works remains, for the time being, his own speciality. One of the reasons, as just shown, is of his own creation. Mr. Livesey's objections to our suggestion are of the nature that might have been expected. It is not of the essence of the idea, however, that the working staff should be shut out from all share in the "unearned increment;" and the remark may be pardoned that the experience of payment by results referred to by Mr. Livesey is not absolutely conclusive against the possibility of finding a solution of the problem in the manner indicated. We certainly do hope, however, that the discussion will not rest here. Although it is not our practice to encourage anonymous letters upon any subject, this topic is peculiarly one which may be properly dealt with by a style of correspondence which does not commit the writer to any personal responsibility for the statement of his views. If, therefore, any reader of the JOURNAL has a suggestion to offer, or a criticism to make upon this most interesting and important question, he need not refrain from submitting his opinions by reason of his not being in such a position as Mr. Livesey enjoys of vindicating his beliefs by overt action.

The Report of the Labour Commission.

THE long-expected report of the Royal Commission on Labour is out at last; and the newspapers will no longer be distracted by concocted statements purporting to disclose the views of majority and minority sections of the Commission. The two Blue-books constituting the first and second parts of what is called the "Fifth and Final "Report" are a monument of devoted labour on the part of the Commissioners, and more especially of the untiring exertions, wide sympathies, and organizing genius of Mr. Geoffrey Drage, the Secretary to the Commission. It is acknowledged in the report itself that the work of Mr. Drage has been of a "special and exceptional character;" and we agree with *The Times* in holding that "whatever "degree of success the Commission may be regarded as "having attained, is in a large measure due" to Mr. Drage. The Commissioners have indeed been singularly fortunate in the selection of their officers; and, as a result, their work has been placed before the world in a manner that commands respect, not only for the intrinsic importance of the subject-matter, but also on account of the style in which the results are recorded. No employer of labour on a large scale can afford to be without a copy of this report. The first part gives an account of the procedure of the Commission, and introduces the report itself.

Special reference is made to the minority report bearing the signatures of Messrs. Abraham, Austin, Mawdsley, and Mann, which was probably meant for little more than an advertisement of the fact that experience of the working of the Commission has left the last named as strong as ever in his crude Socialism. It transpires that this minority report had already been prepared, and was circulated substantially in its present form, at a time when the Commissioners were still engaged in considering the recommendations drafted by the Chairman. At no time were any of these suggestions brought forward in the form of amendments to be proposed to the Chairman's draft report; but the little knot of Mr. Mann's following were determined to appeal direct to the public. Mr. Mann and his three associates in this business would have occupied a far stronger position in the public estimation if they had assisted in the preparation of the general report; reserving to themselves their right of making a minority report in case their views failed to win acceptance.

These Blue-books need careful study to prepare one to form an opinion as to the likelihood of any practical outcome of the investigating labours of the Commission. The majority of the Commissioners declare their belief that legislation would be powerless to remedy many of the evils to which their attention has been called; and they assert that they "look with confidence to their gradual amendment "by natural forces now in operation which tend to sub-"stitute a state of industrial peace for one of industrial "division and conflict." No Socialist could accept such a conclusion; it traverses his most cherished ideals. Lest there should be any misunderstanding of their position in this regard, moreover, the Commissioners definitely state their disbelief in the suggestion that industrial peace is attainable through what are usually known as Socialist or Collectivist methods. They do hold, however, that it is good for workmen and employers to meet in conference together for the purpose of discussing each other's views, and that it is especially good for workpeople to gain something of the experiences of capitalists by investing their savings in different enterprises. It is a wonder that this observation was not supplemented by the suggestion that it would be well for moneyed people to learn a trade, so as to have an insight into the circumstances of the classes which are compelled to earn their own living. Mr. George Livesey appends a note to the majority report (which he signs), stating that, while he agrees generally with it, there are some observations and suggestions with which he is not in complete accord. In particular, he does not consider that the course pursued by the great majority of trades associations is calculated to promote industrial peace. This observation is true enough of the past; but it is possible to hope that, when the mushroom Trades Unions of the last few years have died out, and the others have acquired wisdom through adversity, the residue will have learnt how to combine the interest of their members with that of their paid officials, which will make greatly for industrial peace. Mr. Livesey also contributes Memoranda on "Profit-Sharing" and on the coal miners' strike of last year to the tale of appendices to the report.

Mr. F. W. Dobson, who has successfully managed the Goring and Streatley District Gas and Water Works for the past two and a half years, has accepted the managership of the works of the Mid-Sussex Water Company, supplying Hayward's Heath, Crawley, Cuckfield, and the neighbourhood. The Company are opening district offices at Hayward's Heath; and Mr. Dobson will have entire charge of these and the district. The works which Mr. Dobson is leaving, as well as those he is about to manage, were erected by Messrs. J. and H. Robus, of Bucklersbury; and he was a pupil of Mr. H. J. Robus.

Test of a Pumping-Engine.—A test of a pumping-engine which was carried out at Marlborough (Mass.) a short time ago is described in the annual report of Mr. G. A. Stacey, the Superintendent of the Water Department. They were conducted by Mr. Stacey and other gentlemen. The engine was of the Worthington high-duty type; and its dimensions were as follows: Diameter of high-pressure cylinder, 18 inches; diameter of low-pressure cylinder, 36 inches; net area of plunger, 144·88 square inches; mean stroke, 25·75 inches. The test lasted ten hours, during which time 1,162,504 gallons were pumped over the measuring weir; the total head being 173·13 lbs., and the average piston speed 130·24 feet a minute. The duty developed on 100 lbs. of dry steam was 121,303,000 foot-pounds—15½ per cent. above the guarantee of the makers. The weir measurements of the discharge and the theoretical discharge of the pumps, as figured from the plunger displacement, showed that the slip was 1·2 per cent.

WATER AND SANITARY AFFAIRS.

The additional amounts payable to the Thames Conservancy by certain of the London Water Companies, according to the terms at present defined by the Bill before Parliament, are as follows: The Chelsea Company, £1200; the Grand Junction, £1350; the Lambeth, £1350; the Southwark and Vauxhall, £1250; the West Middlesex, £1350; and the East London, £1000—the total annual addition being, as already announced, £7500. The effect, supposing the Bill to be carried with such a schedule, will be to raise the contributions of the several Companies to the following level: The Grand Junction and the West Middlesex, £4650 each; the Lambeth, £4600; Southwark and Vauxhall, £4550; the Chelsea, £4000; and the East London, £3000—making the future contributions £25,450 per annum, in place of £17,950. But the County Council are not satisfied. The additional payments by the Water Companies were to have been £12,000, instead of less than £8000; and the Engineer to the Council reckons that the cost of carrying out the additional duties devolving on the Conservancy in cleansing the whole stretch of the river will be as much as £15,000 or £20,000 per annum. In order that the Conservancy might properly fulfil its functions, the Council consider there should be a rate not exceeding one-third of a penny levied annually over the entire jurisdiction. But, in the opinion of the Council, the body to which the Select Committee propose to hand over the Conservancy "is one which, from its very constitution, "is wholly unsuited to be entrusted with the power of "rating, which power can alone supply it with funds for "the proper discharge of its duties." Thus things are wrong at both ends; and the Council have determined to use every means to prevent the Bill, as it stands at present, becoming law, even opposing the third reading in the House of Commons.

In his address to the shareholders of the Chelsea Water Company at their half-yearly meeting last Thursday, Sir W. H. Wyatt remarked that the opposition of the County Council created some doubt whether the Conservancy Bill would get through the Commons. As Governor of the Company, he suggested it might be better if the Bill were to pass, because no one knew what the Council might bring forward next year. Of course, there would be an enormous expenditure connected with these parliamentary proceedings; and the Council, being in the advantageous position of fingering other people's money, "did not seem "to care what they expended." A point of much importance adverted to by the Governor was that of the proposed storeage reservoirs at Staines. It was declared that the Chelsea Company would be glad to see the scheme carried out "to a reasonable extent." Some of the Companies were said to be consulting together on the subject; while others stood aloof. The prospect was that of "a minor "plan" being adopted, and one, too, that would be satisfactory to the Royal Commission. Land had already been secured for the purposes of the scheme, and those who had taken up the matter "were in earnest." We shall be glad when the project takes a substantial and definite shape; for what with Messrs. Hunter and Fraser's plan (which we were assured the other day "had not been set "aside") and the Bill of the Southwark and Vauxhall Company, together with the hopes thrown out at the Chelsea meeting, it is rather difficult to see what is really coming. On the whole, it is a good sign that some of the Companies are fully roused, though a few of them refuse to act. Some months ago, we urged on the Companies the necessity for a forward policy; and at the present time it cannot be said they are altogether inert. The County Council are moving in two ways at once. While preparing a Welsh scheme of supply, a proposal comes before them to-day from one of their Committees, that the necessary arrangements be made for introducing in the next session of Parliament one or more Bills for the transfer to the Council of the undertakings of the Metropolitan Water Companies, or such one or more of them as the Council may hereafter determine. It is recommended that these Bills shall be "on the lines" of the resolution of Feb. 27, which stipulated that no "monopoly right" on the part of the Companies should be recognized. As far as legislation for the present session is concerned, the three principal Water Bills passed their third reading in the House of Commons last evening.

THE INCORPORATED GAS INSTITUTE.

PROCEEDINGS AT THE THIRTY-FIRST ANNUAL GENERAL MEETING,

HELD AT THE

WESTMINSTER TOWN HALL, JUNE 19TH, 20TH, & 21ST, 1894.

JOHN WEST, ESQ., M.Inst.C.E., President.

REVIEW OF PROCEEDINGS.

THE Incorporated Gas Institute must be credited with having brought fine weather with it for the opening meeting on Tuesday; for the unsettled climate of this so-called summer appeared to have repented of itself for this occasion. When Mr. John West took the chair at the Westminster Town Hall, the morning was so fine that it seemed almost a pity to spend the day indoors. But the majority of the members of the Institute who had come to town for the meeting were proof against the temptation to enjoy the rare treat of a perfect summer's day; and consequently a very creditable assemblage greeted the popular President when he and his faithful Council took their places for the purpose of opening the proceedings in due form. There was rather too much "form," if we may say so, about this business; for the Secretary was put to the trouble of reading the minutes of the last meeting, which was certainly a work of supererogation; and, if we may venture to offer a small suggestion to the Council for their guidance in the future, we would hint, with all humility, that this means of spinning out time might be dropped with advantage.

We are, however, diffident about commenting upon the proceedings of The Gas Institute Council; for the moving of the adoption of the report for the year, which was the next business, was made by Mr. W. R. Chester the occasion of a—well, decidedly not temperate onslaught on the JOURNAL for having the temerity to question the wisdom of the Council in proposing to take up the work of the defunct Gas Companies' Association. Mr. Chester waxed mightily sarcastic upon this head; and he was followed in the same strain, *more suo*, by Mr. George Anderson. It is quite unnecessary to devote any particular attention to this incident, which revealed a particularly "touchy" condition on the part of the Council; especially as, in reply to Mr. Carr, who also, strangely enough (?), questioned the wisdom of the action of the Council in this regard, the President gave the assurance that this action would not amount to much, after all. It appears, however, the Council are averse to being criticized. They like to flatter themselves with the idea of their own infallibility. This is all very well; but since in this world it is only those who do nothing who never commit mistakes, the most prudent course for the Council to take, if they are not to expose themselves to occasional fault-finding, will be to do as little as possible. It is a pity, however, that they do not feel strong enough to take a bit of adverse criticism in good part, but must needs turn every comment into a question of "want of confidence."

Mr. W. A. Valon was well received when called up by the President to be the recipient of the Birmingham Medal. It could have been wished, for his sake, that the President had prepared himself for this part of his duty by putting together a better account of Mr. Valon's services to the gas industry than was contained in the bare statement of his having received four silver medals and first premiums for papers contributed to the Institute. As a matter of fact, there are few working gas engineers and managers who have done more in their degree for the gas industry than Mr. Valon, whose professional standing is altogether superior to the grade in which he would be placed as manager of the gas undertaking of a small town on the south coast. We have no hesitation in stating that, if the Birmingham Medal is to continue in respect, it must be awarded for just such merits as those which have earned it for Mr. Valon.

The President's Medal and first premium for last year's papers was given to Mr. David Terrace, of Middlesbrough, for his careful paper on inclined retort-settings. Mr. Bryan Donkin took the second, and Professor Lewes the third premium—neither recipient being present in person. Then followed the event of the morning—the delivery of Mr. West's Inaugural Address.

The President's address was characteristic of the man; being familiar in style, discursive in matter, and instinct with the plain, honest wisdom that comes to a gas engineer of homely, common-sense cleverness, rather than of brilliant acquirements, in the course of forty years of such varied experience as that through which Mr. West has passed since his start in life at Northampton. We shall anticipate a very obvious suggestion in criticism when we observe that the chief distinction of the address lies in the omission of all reference to Mr. West's stoking machinery. There is no mean art in this careful avoidance of a topic which nine out of ten of the President's auditory probably expected to hear treated of at length. Mr. West will have his reward. People will think more about the matters that have gone to render the name of West famous among gas engineers of the present generation than they would have done if he had fallen into the snare of using his eminence as head of the Institute to advertise the wares of his firm, or even to display his own special mastery of the points of mechanical stoking. And the professional standing of the President will be enhanced by the proof he has given of his ability to talk with authority to gas engineers, as a gas engineer, of other aspects of the common calling besides that which must always be most prominently in his own mind.

The address began very properly with references to, and explanations of, the heads of the report of the Council. We fail, however, to find in the presidential remarks anything to alter our opinion of the actions of the Council in regard to turning the Institute into a gas companies' protection society, and in deciding to issue certificates of membership. The only addition made by the President to the previously published intimations as to the proposed proceedings of the Council in the former matter is the declaration that it is their intention to send to all the Gas Companies and Corporations who subscribe to the funds of the Institute, copies of the Board of Trade returns—a handsome and a spirited resolve, truly! If this is the sort of thing that the Council regard as constituting the work of a gas companies' protection society, their new departure will not carry them far. With regard to the question of membership certificates, there is nothing more to say. Doubtless, as President Lincoln remarked on one occasion of a questionable affair, "For those who like that sort of thing, this is just the sort of thing they like;" but it is difficult to perceive how a certificate of membership of a purely mutual association, as The Gas Institute is, can be esteemed a valuable personal possession. Although we maintain this view, it is not with the object of casting any slur upon the Institute. We merely argue that membership of a trade society is nothing to boast of. On the other hand, the President of such a society may reasonably regard the circumstance of his election as a testimony to the fact of his holding a creditable position in the industry with which the society is identified. Hence we have no objection to such mementoes of this honourable incident in the life of a professional man as the President's medals of the North British Association of Gas Managers.

Leaving this small matter, the address goes on to give expression to the President's views of several technical questions; beginning with the principles governing the expenditure of capital upon gas-works construction. Mr. West lays stress upon the commercial object of gas-works, reminding his hearers that, in the construction of such factories, "a pound should not be spent unless by its use a dividend can be earned sufficient to pay interest upon the sum expended." This is somewhat vague; but it is not difficult to perceive the President's drift. He evidently wants to discredit the monumental style of gas-works design, by which it is possible to greatly increase the cost of a building or a gasholder as compared with simpler and equally serviceable works constructed after commercial principles. This is a worthy aim; but it should not be overlooked that the modern fashion of designing gas-works with a view to the saving of labour puts the question of capital outlay upon a totally new footing. Gas-works are likely to cost in the future very much more at first hand

than was usual in times past. We must now have everywhere lofty, airy, spacious stage retort-houses, fitted with hoists, conveyors, and many other appliances which the old gas managers never dreamt of. The difference of style, once accepted as natural, between retort-houses in medium-sized and in large works, is being replaced by a striking uniformity, proceeding from a clearer perception of the fact that a ton of coal or coke weighs just as much in the country as it does in town. What we need to insist upon now in this connection is, therefore, the closeness of the relationship between prudent, far-sighted capital outlay and working economy. The question before the modern gas-works constructor is how to make savings in wages pay for capital expenditure. The whole problem of economical gas engineering has changed its bearings during the past twenty years.

The President emitted an old cry when he accused the sliding-scale of a tendency to promote the starvation of works. We have heard the warning many times; but we have very rarely discovered any examples of the evil apprehended. Cases undoubtedly exist of greedy directors and weak managers; but it is not true that the upkeep of the average sliding-scale company is less attended to than in the case of non-sliding-scale or even of municipal works. Figures are notoriously misleading in this regard—some establishments requiring much more money than others to keep them up to the mark; but we should expect to find the starvation of works a failing of municipal rather than of sliding-scale administration.

The President had something to say upon the subject of gas enrichment; and he pointed out some of the difficulties that stand in the way of the successful "doctoring" of gas. As an old gas manager, Mr. West is anxious for information in regard to stratification of the contents of gasholders; and he lays stress upon the effects of largely increasing the proportion of carbon monoxide in a lighting gas. He is, we believe, the first of gas engineers to realize the importance of the short flame *versus* long flame observations of Professor Lewes, of which a good deal more is likely to be heard before long.

The address goes on to discuss the altered circumstances of gas undertakings since the dawn of the era of cheap oil and electric lighting. There can be no doubt but that the influx of the able, keen, pushing engineers connected with the latter industry into the business of artificial lighting, has had a marked influence upon the public with which they have had to deal. Without going so far as to say that the average electric light engineer is a smarter man than the average gas manager, it may be held that the former is the greater novelty. He has all the advantage that freshness confers upon a new cause; and he deals with the problems of lighting in a different style from that of the man who has hitherto regarded it as his sole duty to make gas. The electrician knows that electricity in itself has no interest for the consumer; so he sets himself to make it interesting in its applications. The gas manager has expected his public to be content with gas, and has troubled himself little with its applications. This will have to be altered if gas is to increase its popularity.

It is for gas companies to encourage the expert in lighting, who is not necessarily the same as the successful gas manager. Mr. West is himself a good hand at expounding the rights and wrongs of gas lighting; but it would be too much to expect the same facility of every gas manager. The right men can be had, however, if gas companies desire to employ them; and it is to be hoped that the President's remarks on this subject, which take up the middle portion of his address, will bear fruit in the right times and places.

The subject of prepayment gas supply occupies a good deal of the address; and what Mr. West has to say upon this debateable topic is well worthy of attention. He takes the broad view of the matter which has always been upheld in the JOURNAL; and, while recognizing the controlling principle of commercialism in regard to all projects for popularizing gas, he holds to the opinion that the "net" of the gas manufacturer should be cast very wide over the community. By all manner of means must the gas industry be maintained in its present pre-eminence, and must also be made secure for the future by the diligent pursuit, on the part of gas managers, of all roads to popularity.

Here let us break off in our course of critical appreciation of Mr. West's observations to relate an incident that came under our own notice. We lately overheard a railway constable, at a station not far from London, recounting his experience of a penny-in-the-slot meter to a friend in the painting and decorating line. Not much was said on the subject of details; but the constable wound up the amicable discussion by saying: "Ah, well! There is nothing like gas, after all, either for cheapness or comfort." He was a proselyte, and was making another.

The President had something to say respecting the distribution of power by means of gas; but he did not contribute anything material to the available stock of information respecting this subject. Mr. West is not one of those engineers who like to talk about British thermal units as though these philosophical concepts were as tangible as bricks; but he can build machines which work and can be made to serve as texts for professors of engineering to dilate upon. The address suddenly breaks off at its close into a statement of the experience gained, in connection with the Whitworth Scholarships, of the effects of collegiate and workshop training for engineers. It is rather startling to find observations of this kind in such a place. As to the matter that seems to have been in Mr. West's mind when he composed these somewhat disconnected observations—the vexed question of the best training for an engineering career—we confess ourselves to be more than a little sceptical respecting the real value of any regular *curriculum*. Mechanics, draughtsmen, estimating clerks, quantity surveyors, computers of strengths and strains, can be trained in workshops and schools; but engineers—that is to say, men gifted with the power of combining men and matter into an undertaking—must be born for the life. What made Mr. John West? His early training? Not a bit of it. He made himself, being what he was to start with; and so do we all in our degree. Let us cultivate our garden, by all means; but unless the soil is right to begin with, we shall not bring forth much fruit. And, after all, the issues of men's careers are in higher hands; wherefore is it wise for a man to do with all his might the work that lies nighest to his hand, nor trouble himself overmuch in respect of the general result.

Tuesday afternoon was practically devoted to Mr. Thos. Newbigging's paper on "Illuminating Power and Illuminating Effect," as to which the best that can be said is that it fairly "started the ball rolling" for a radical reconsideration of the subject. The student will seek in it in vain for fresh facts. It is mainly a statement of opinions; but the opinions are such as to set other men looking up the facts. As we shall probably have more to say upon this subject later on, we shall not now deal at length with this paper or the discussion upon it. Mr. Corbet Woodall was Mr. Newbigging's strongest opponent; but it can hardly be said that either paper or discussion exhausted the matter. We do not propose to comment *seriatim* upon the papers which most profitably occupied the time of the Institute for three solid days of unremitting attention to business, beyond acknowledging that at least two of them—those by Mr. James Stelfox and Mr. W. R. Chester—would have conferred distinction upon any gas managers' meeting; and that several others were quite up to the best average style of such compositions. One thing was satisfactorily established—that the experiment of three all-day sittings was in this instance a conspicuous success. There were better attendances from first to last than we remember to have noticed at any previous Gas Institute meeting; and the interest was well kept up. On the whole, moreover, the quality of the discussions was distinctly high. The Westminster Town Hall was found to be a great improvement, for the purposes of the Institute, upon the Institution of Civil Engineers. The hall of assembly was just the right size; its acoustic properties were good enough; and the style of decoration was restful to the eyes. The lighting was hardly suitable for the display of diagrams; but this was no serious drawback. Three days spent in the more cramped Great George Street establishment would have been much more tiring. The supplemental conveniences of the Westminster Town Hall are, besides, very greatly in its favour as a gathering-point for several hundreds of people for the better part of a week. There is here plenty of room, and complete quiet.

The business of the meeting was satisfactorily wound up on Thursday afternoon with the election of Mr. R. Mitchell, of Edinburgh, as the new President, and the selection of this city for the next meeting. The customary vote of thanks accorded to the retiring President was no perfunctory tribute, but a really hearty recognition

of the merits of one of the most deservedly popular Presidents who has ever sat in the chair of the Institute. If only for his hospitality to the members and their friends last Wednesday night, when he held a most successful reception, and gave a most enjoyable and well-attended dance at the St. Martin's Town Hall, Mr. West deserved the thanks of his colleagues. But he has done more for the Institute than merely entertain. He has worthily followed in the footsteps of those of his predecessors in the chair who have set themselves to elevate the organization; and if the general result of the meeting of 1894 is to assure the prospects of the Institute for a future brighter beyond the hopes of its best friends of a few years back—which is certainly the case—this happy effect is largely due to the conduct of the retiring President, aided in the task by Mrs. West, and devotedly seconded by the Honorary Secretary (Mr. Hepworth), and a strong and united Council.

The excursion to Oxford on Friday was eminently successful, and was well carried out in every particular. It was a long day; and the necessary arrangements for the comfort and pleasure of the large party were perfectly designed and executed. Leaving Paddington at 9.30 by special train, the members of the Institute and their friends, to the number of nearly 300, reached the beautiful and venerable University City by about 11, and proceeded to view the colleges and chapels. At the conclusion of the luncheon, which, in accordance with a sound, but not always practicable principle, was partaken of in common, the party left Folly Bridge in steam-launches for Nuneham; and, after spending a brief but pleasant time in this celebrated spot, the return was made by the same means to the city. There tea was served; and a delightful day was brought to a close by the return of many of the party to London; while others, finding themselves so far upon their road, went northwards home. The weather all day was perfection.

REPORT OF PROCEEDINGS.

The Thirty-first Annual General Meeting of the Institute was held on Tuesday, Wednesday, and Thursday last week, at the Town Hall, Westminster, under the presidency of Mr. JOHN WEST, M.Inst.C.E.

A WELCOME BY THE PRESIDENT.

The PRESIDENT, in opening the proceedings, remarked that, when the Institute held their meeting in one of the large towns in the provinces, they were generally welcomed by the Mayor, or by some important personage; but when they met in the city of cities, this duty devolved upon the President for the time being. It therefore gave him great pleasure to do this; and he hoped they would have a most successful meeting—profitable both to themselves individually and to the gas industry as a whole. Having explained that they had been unable to obtain the customary use of the hall of the Institution of Civil Engineers for the meeting, owing to structural alterations being undertaken there, he called upon the Secretary to read the minutes of the Belfast meeting.

CONFIRMATION OF MINUTES.

The SECRETARY (Mr. F. G. Burfield) having complied, the minutes were confirmed.

APPOINTMENT OF SCRUTINEERS.

Mr. J. Morton (Ashford) and Mr. G. Tooley (Leeds) were appointed Scrutineers of the ballot-papers.

THE COUNCIL'S REPORT—THE WORK OF THE LATE GAS COMPANIES' ASSOCIATION.

The report of the Council, which was summarized in the JOURNAL for the 5th inst. (p. 1063), was then taken as read, and discussion upon it invited.

Mr. W. R. CHESTER (Nottingham) moved the adoption of the report. In so doing, he said he did not propose to deal with it in detail, but merely to refer to one paragraph—that which related to the taking up by the Institute of the work of the old Gas Companies' Association. This was a new departure; but inasmuch as that Association was now defunct, and as it had done very excellent work during its existence—in connection with gas companies rather than with undertakings that were under the control of corporations—it seemed a pity that the work should not be continued. It consisted in furnishing, to gas companies situated in the provinces, information relating to the principle points of parliamentary procedure which, either directly or remotely, affected them; and on the extinction of the Association, it was suggested to the Council that they might appropriately take up a portion of that work. Having gone carefully into the *pros* and *cons*, they decided that they could be of material service to provincial gas companies in this direction. Beyond that, the Council did not propose to go. He was sorry to say this matter had been entirely misapprehended, and consequently misrepresented, by the JOURNAL OF GAS LIGHTING in one of its leaders. It was not proposed to engage Counsel or to carry out parliamentary work for any of the companies to which he had referred, but merely to obtain the information at first hand, and then, through the Secretary, place it at the disposal of those members who might be interested. Members connected with municipal gas undertakings would be aware that there was an Association, called the Association of Municipal Corporations, which did this particular class of work for municipalities. They had a central office in London; and every municipal body connected with it was furnished with all necessary information as to parliamentary matters. The old Gas Companies' Association carried out similar work for the gas companies; and the object of the Council was to continue this work. When the matter was under consideration, it naturally became a question how it could most easily be put in practice; and it was suggested that Mr. William Livesey, the late Secretary of the old Association, might put them in the way of obtaining the information required. Mr. Livesey was seen; and he very willingly gave every information in his power, and volunteered to continue, for a small remuneration, the medium through which this information should be gathered and passed on to the Secretary. The Council at once closed with this offer; and they had arranged with Mr. Livesey, for a merely nominal sum, to furnish details of any Bills, or the principles of any Bills, affecting the gas industry, to the Secretary, who would distribute the information throughout the country. He (Mr. Chester) thought it was rather consoling, in view of recent criticisms, to remember that the prognostications of the JOURNAL with regard to the success of the Institute had almost invariably turned out to be utterly wrong; and he personally felt quite sure that, generally speaking, the Council were going most on the right lines when the JOURNAL thought they were going utterly wrong.

Mr. J. LOWE (Weymouth) seconded the motion. He said that, as representative of a Company who had derived considerable advantage from the late Gas Companies' Association, it was a source of great gratification to him to know that this work was to be taken up by the Institute. Many of his friends in the country shared his views; and he thought they owed a deep debt of gratitude to the Council for their action in this matter.

Mr. WILLIAM CARR said he should like to know what was the estimated cost of this addition to the work of the Institute. Mr. Chester had told them the cost would be merely nominal. He did not know much about the work of the old Gas Companies' Association, as he was not connected with it—his experience being mostly with corporations; but still, if there was some good to be done, he had no objection, only he should like to know what it was going to cost. He should also be glad to learn whether the information was to be collected, printed, and sent to every member, or only to those who applied for it. As the matter had been brought prominently forward, it was as well that it should be thoroughly discussed.

Mr. T. NEWBIGGING (Manchester) remarked that he had not intended to say anything on the subject before the meeting; but, as the President had invited expression of opinion, he would state that personally he was not strongly in favour of this new move of the Council, for various reasons. He looked upon it that the work performed by the late Association concerned the shareholders of gas companies rather than gas engineers, or even gas consumers. He thought it would be wise to consider the matter well before taking a serious step of this kind; and he would suggest that it should be deferred for twelve months. It appeared that gas companies would be principally, if not solely, benefited by the work to be done; whereas a large minority, if not actually a majority, of the members were connected with corporations or local authorities, who,

it appeared, would have to contribute to the expense of collecting the information supplied. This struck him as something akin to taxation without representation, to which he was greatly averse. He would, therefore, move that this question be deferred for twelve months, to allow of its further consideration.

Mr. GEORGE ANDERSON (London) thought it would be a pity to "hang up" for twelve months what seemed to him to be a mere trifle. The Council had gone to very little expense as yet; and they had still to formulate their arrangements. Some companies with which he was connected were members of the old Association; and he thought they paid a subscription of a guinea per annum. He had several times found it very convenient to be a member. If anything cropped up on which they required information, they had only to send to Mr. Livesey, and they obtained it at once—not only with regard to matters which were coming before Parliament, but things which had previously been before it. He gave them, in fact, the benefit of his very long experience, which was often of considerable value. He thought the members might fairly be asked to trust the Council, and not hold the question over for a year, but simply see what they did; and if they did not like it, they could stop it at any time. He had seen some adverse criticisms in the JOURNAL OF GAS LIGHTING; but he could not see why the Editor should be so anxious to keep them straight. He thought they could manage their own affairs without advice from any newspaper; and seeing that the JOURNAL had constantly, whenever it had the opportunity, spoken or written against the Institute from the time of the disruption, he did not think they need pay much attention to such criticisms. He hoped members would support the Council in this matter.

Mr. J. CHEW (Blackpool) cordially supported the Council. He said he was connected with a Corporation who contributed to the funds of the Institute; and if all corporations would do the same, it would be much better for all parties. They were not there to benefit themselves only, but the companies and corporations they represented; and this being the case, every scrap of information which could be distributed among them would be of service, either individually or collectively. There were many small companies and corporations who had not the means of getting the information they desired, which, under the proposed arrangement, would be circulated; and some of it, he had no doubt, would be tabulated and distributed, as being likely to be useful to the whole body. So far as newspaper criticism went, he always considered that the editor of a paper only represented his own opinions. Of course, he might occasionally be "inspired;" but it was, after all, only the opinion of one man, and was worth just as much as his (Mr. Chew's) own.

Mr. LOWE said his Company subscribed two guineas to the old Association; and he thought it was one of the best investments they ever made. He should have no hestitation in recommending any company he was connected with to subscribe to the Institute for carrying on the proposed work.

The PRESIDENT said the Council were anxious that this matter should be thoroughly discussed by the members; and he might perhaps elucidate one or two points which had been touched upon. Mr. Carr was anxious to know what obligations they had entered into; but he (the President) hoped he would be satisfied with the statement that they were merely nominal, and that they had the money in hand to pay for what they had contracted for. They felt that, as many companies subscribed to their funds, they ought to give them as much information as possible, and that this was one of the subjects which might very well be taken up, seeing that the old Association had been discontinued, and no one had come forward to do its work. He could not see why they should be blamed for doing what other people had left undone. The Institute were in a prosperous condition; and he thought they should have an opportunity of showing what they could do. At the end of the year, let them be commended or blamed according to the result. The idea was not to infringe upon the subscriptions of the members, but to pay the expenses out of the contributions obtained from the gas companies and corporations. They were not poaching on anyone else's preserves, but doing what would otherwise be left undone. He hoped, therefore, the members would unanimously support the Council.

The resolution was then put, and carried *nem. con.*

THE ACCOUNTS.

The PRESIDENT, in presenting the statement of accounts, said the Council had been struggling for some years to bring them into a satisfactory condition; and they had at last been fairly successful, for there was nothing outstanding, except a small balance due for legal expenses incurred some years ago, which would be wiped off before Christmas. They were now, therefore, more than paying their way; various economies having been introduced during the past few years, without any sacrifice of efficiency—in fact, the work was now going on more efficiently and prosperously than it had done at any time since the Institute was reconstituted.

Mr. H. ASHTON HILL (Wallasey) then moved that the accounts be printed and published.

Mr. W. DUFF (Morecambe) seconded the motion; and it was carried unanimously.

THE BIRMINGHAM MEDAL.

The PRESIDENT next proceeded to present the Birmingham Medal to Mr. W. A. Valon, for the great services rendered by him to the gas industry. Mr. Valon had, he said, already received prizes on four occasions for papers read at the annual meetings; and everyone would agree he was thoroughly well qualified to receive the medal.

Mr. VALON, in responding, said it was very difficult to find suitable words in which to express his thanks for this last, and greatest, honour which had been conferred upon him. He did, however, thank the members very sincerely; and he assured them that the kindnesses he had received from them individually and collectively rested far down in his heart, and would never be forgotten.

PREMIUMS FOR PAPERS.

The PRESIDENT then announced the award of premiums for papers, as follows:—

First Prize.—To Mr. David Terrace, of Middlesbrough, for his paper "On the Setting and Working of Inclined Retorts at Middlesbrough."

Second Prize.—To Mr. E. Bryan Donkin, for his paper "On Rotary Engines and their Application to Gas Exhaustion."

Third Prize.—To Professor Vivian B. Lewes, for his paper "On the Enrichment of Coal Gas."

The PRESIDENT presented the medal and first prize to Mr. Terrace personally.

Mr. TERRACE having returned his acknowledgments in suitable terms,

Mr. H. THOMAS, who attended on behalf of Mr. Donkin to receive the award, expressed that gentleman's thanks for the honour done him.

Professor Lewes was not present to receive the prize awarded to him.

PRESIDENT'S ADDRESS.

The PRESIDENT then delivered his Inaugural Address, which was given in the JOURNAL last week (p. 1163).

Mr. NEWBIGGING said he rose to express what he was sure was the feeling of everyone present—that the address they had just listened to was one of great excellence, and of the highest usefulness. They would all join in offering their warmest congratulations to Mr. West on having obtained the presidency of that important Institute. It was long since he first began to take a prominent part at the meetings; and no one could deny that he had well earned the honour conferred upon him twelve months ago. He proposed that their best thanks should be given to him for the address; and he would couple with it the hope they all cherished, that his life might be long spared to adorn the profession to which, by his energy, perseverance, and enterprise, he had contributed so largely.

Mr. J. HEPWORTH (Carlisle), in seconding the proposal, said he should like to congratulate Mr. West on his good fortune in being called upon to preside over so excellent a meeting. It was unfortunate, in some respects, that it had been necessary to alter the date, which led to the receipt of many letters of regret from gentlemen who were unable to be present, and possibly some had not found their way to the hall. No one, perhaps, was better able than he was to appreciate the amount of labour which fell to the lot of the President; and they might be sure that, in proposing a vote of thanks to him for a year's hard work, and finishing it with so able an address, they were not according thanks which had not been fairly earned.

The motion having been carried by acclamation,

The PRESIDENT thanked the members for the kind way in which the resolution had been received. He said he had striven to do what he could; and he hoped the office he had filled would not suffer at his hands.

The meeting then adjourned for luncheon.

READING OF PAPERS.

On the resumption of the proceedings in the afternoon, the reading of papers was commenced, and was continued on the next and the succeeding day. They were taken in the following order:—

Tuesday.—(1) "Illuminating Power and Illuminating Effect." By THOMAS NEWBIGGING, of Manchester. (2) "A Plea for Differential Prices for Gas." By GEORGE ANDERSON, of London.

Wednesday.—(3) "An Improvement in the Construction of Atmospheric Gas-Burners." By C. B. VOISEY, M.D. Lond., M.R.C.S. Eng. (4) "A First Season's Experience of Carburetted Water Gas." By JAMES STELFOX, of Belfast. (5) "Notes on Gas Manufacture at Wallasey, with Special Reference to Enrichment by Cannel." By H. ASHTON HILL, of Wallasey. (6) "The Application of Coal Tar for Making Gas." By C. STAFFORD ELLERY, of Bath. (7) "The Construction and Working of Regenerative Settings of Retorts." By W. R. CHESTER, of Nottingham. (8) "Gaseous Fuel." By T. TRAVERS, of Cork.

Thursday.—(9) "Gas and Electric Lighting at Blackpool." By W. CHEW, of Blackpool. (10) "Steam Applied as an Aid to the Revivification of Oxide of Iron *in Situ*." (Second Paper.) By F. G. DEXTER, of Winchester. (11) "Some Experiences with Leaky Tanks." By J. CHADWICK, of Oldham. (12) "Some Special Applications of Gas." By N. H. HUMPHRYS, of Salisbury. The last paper on the list—viz., "Gaseous Fuel in the Retort-House," by T. S. CLEMINSHAW, of Launceston, Tasmania—was taken as read.

The first four papers will be found in another part of the JOURNAL to-day. The remainder, with the report of the discussions, will be given in subsequent issues.

REPORT OF THE SCRUTINEERS.

The result of the election of office-bearers for the ensuing year was as follows:—

President.—Robert Mitchell, of Edinburgh.

Vice-Presidents.—W. R. Chester, of Nottingham; C. Stafford Ellery, of Bath.

New Members of Council.—D. Terrace, of Middlesbrough; T. Duxbury, of Darwen; J. M'Gilchrist, of Dumbarton; and A. Dougall, of Tunbridge Wells.

Auditors.—Alfred Lass, F.C.A., of London; W. D. Child, of Romford.

Hon. Secretary.—J. Hepworth, of Carlisle.

Benevolent Fund Committee.—T. Bower, West Hartlepool; P. Simpson, Rugby.

NEW MEMBERS.

The SECRETARY read the following list of new members and associates, and of those transferred to the class of members:—

Members.—Auchterlonie, J. W., Mullingar; Barker, H., Pontypridd; Bower, W. A., Glasgow; Brockway, E. J., Cleethorpes; Brown, G. F., Cardiff; Chew, W., Blackpool; Dewar, J., Newtownards; Falkner, H. W., Sandown (I. of W.); Farrington, T. B., Conway; Gibson, J., Beverley; Graham, A., Mansfield; Hands, T., Enniskillen; Herring, R., Dover; Hill, J. R., Droylsden; Hislop, G. R., Paisley; Hislop, L., Bothwell (N.B.); Lamb, J. E., Altrincham; Lee, F., Marsden; Lupton, G. W., Otley; Millard, E. H., Durham; Mimmack, W. B., St. Mary Cray; Morgan, W. H., Rhayader; Murray, W., Uttoxeter; Nutter, W. H., St. Anne's-on-the-Sea; Salmon, P. J., Galway; Shaul, E., Penrith; Townsley, R. H., Leeds; Waddell, A., Broughty Ferry; Walsh, T. M., Tuam; Watson, E. O., Rawmarsh; West, A., Rastrick; Woodward, W. W., Salford.

Associate Members.—Baxendale, W., Chorley; Bond, J., Salford; Cuthbert, A. G., Londonderry; Cutler, A. E., Banbury; Dowse, W. J., Bradford; Duxbury, T. H., Manchester; Hoyte, P. S., Nottingham; Masterton, A., Edinburgh; Morley, H. L., Cardiff; Shaw, H., Salford; Stears, S. M., Belfast; Stelfox, J. C., Belfast; West, F., Nottingham.

Associates.—Ball, S., London; Cowan, W. H., Edinburgh Hardy, W. A., Uxbridge; Harrison, F. A., London Main, A. P., Glasgow; Stubington, S. C., London; Waring, G. M., Tipton; Willey, H. A., Exeter.

Transferences.—Associate Members to Members: Holliday, J., Scarborough; Thomas, O., Cardiff.

AN HONORARY MEMBER.

The PRESIDENT said it was his duty, in accordance with custom, to nominate the President of the Société Technique du Gaz en France for election as an honorary member. He believed that the President of the Society would nominate Mr. Mitchell as an honorary member.

The motion was carried unanimously.

PLACE OF NEXT MEETING.

The PRESIDENT said the next question to decide was the place of meeting for the ensuing year. The Council had not come to any special decision on the subject; but, inasmuch as Mr. Mitchell was the forthcoming President, and they were going to Scotland, it might be considered advisable to meet in Edinburgh.

Mr. R. HUNTER (Chester) proposed that the next meeting take place in Edinburgh.

Mr. ANDERSON seconded the motion; and it was carried.

VOTES OF THANKS.

Mr. T. BOWER (West Hartlepool) then proposed a vote of thanks to the authors of papers. He said that, whatever might be the misdoings of the Institute, no one could blame them for not having had papers either sufficient in number or sufficiently high in quality. When they considered the time and attention these gentlemen had to devote to bring together such a mass of information as they had given to the members, the least they could do was to accord them a very hearty vote of thanks. It had been remarked, at an earlier stage of the proceedings, that, in preparing a paper, a certain amount of information was derived by the author, of which, before entering on his work, he had perhaps no idea. From his own experience in the preparation of papers he could thoroughly bear out this statement; and he had no doubt the authors of the various communications had had similar experience. They must have been at very great trouble in collecting the information they had brought forward; and it gave him great pleasure in proposing the motion.

Mr. H. WILKINSON (Harrogate) said he was equally pleased to second the vote of thanks. He was quite sure that he only expressed the feeling of all those who had had the pleasure of hearing the papers read, that they had been of an exceedingly high technical and practical character—in fact, of such a character as any institute might well be very proud.

The motion was carried unanimously.

Mr. R. PORTER (Elland) moved that the best thanks of the meeting be accorded to the Scrutineers—Messrs. Morton and Tooley—who had performed their duties with satisfaction to everyone concerned.

The motion was carried unanimously.

Mr. W. R. COOPER (Banbury) proposed that the best thanks of the meeting be presented to the Auditors for their services.

The proposition having been agreed to,

Mr. P. SIMPSON (Rugby) said he felt quite proud in being entrusted with the duty of proposing a hearty vote of thanks to the Council. If the members would only think of the three days that had passed, and all the time taken in arranging for such a grand meeting, they would know what a great deal of work the Council had had to go through. He felt sure that, in the life of the Institute, they had never had a better, a more harmonious, or a more united meeting.

Mr. E. C. RILEY (Swindon) said that he had not had the pleasure of spending much time at the meetings of the Institute since that unfortunate one which some might remember, when everything was not quite harmonious; but the present meeting had been one of a very different character. No doubt the Council had had considerable

anxiety in making arrangements; but they had been very successful in providing for the convenience and comfort of all who had attended. He had great pleasure in seconding the motion—not only thanking the Council for their work in the past, but having a lively expectation of favours to come.

The motion was carried unanimously.

Mr. T. H. MARTIN (Barnet) then proposed a very cordial vote of thanks to the President. He said no words of his could express the way in which Mr. West had done his work during the past year. From the very beginning he had worked hard at the Council meetings, and in every duty he had undertaken. He had known Mr. West for upwards of 25 years, and he believed he had been connected with the Institute longer than this; and from the very beginning, he had been a most active member. They had lively recollections of his papers and his other work, besides what he had done for the gas industry in general, both in England and elsewhere. It was their duty to give him a very hearty vote of thanks for his kind and genial manner in the chair, for his admirable address, and for all that he had done on behalf of the Institute.

Mr. CHEW, in seconding the motion, said the President had for many years been trying to impress upon them the necessity of improving the modes of manufacturing gas. As he (Mr. Chew) looked upon him, the thought came of what the English race was made—of course, in the English race he included also the Scotch and Irish. They never knew when they were beaten; and Mr. West was of that John Bull sort of character that he never knew when he was beaten. He went on with unflagging spirit, and overcame every difficulty which presented itself from time to time. He had been the right man in the right place; and he cordially seconded the vote of thanks.

The resolution was carried by acclamation.

The PRESIDENT thanked his friends for the very kind way in which they had just spoken of him. If he had done anything which would be of service to anyone individually, or to the gas industry generally, he should be well recompensed for the trouble he had taken during the past year. There had certainly been a little work connected with it; but anyone who "put his hand to the plough" should go on from day to day without ever "looking back." He had done what he could in the interest of the Institute; but he must also say that he had been very ably supported by a hard-working Council. The meetings had been splendidly attended; and every time they had met, they had done some very useful work. He thanked them all for their kindness, and also for the great interest they had shown in the business of the meeting. He then proposed a vote of thanks to Mr. Burfield, the Secretary, who, he said, had worked heartily and well. The result of his labours had been shown in the several ways in which success had been attained throughout his year of office.

The resolution having been passed,

Mr. BURFIELD thanked the members most sincerely for their vote, and assured them that it would be his endeavour to carry out the duties of his office to their entire satisfaction, and, he earnestly hoped, to the ultimate success of the Institute.

Mr. CHESTER moved that the best thanks of the meeting be accorded to the Honorary Secretary for his services to the Institute during the past year. He said he did so with a very great deal of pleasure, because he had come in contact during the past few years with the work of Mr. Hepworth in connection with the Institute. Those who came most intimately in contact with him knew how thoroughly, and with what perfect tact and judgment, it had been done. A short time ago, an anonymous letter appeared in the JOURNAL OF GAS LIGHTING, calling in question the continuance of the honorary secretaryship. For the information of that anonymous writer, he might mention that the office was part of the constitution of the Incorporated Gas Institute. When the Articles of Association were drawn up, there was evidently no intention in the minds of the Executive that the position of Honorary Secretary should be abolished. He believed it was an exceedingly necessary one; and no one could fill it with such perfect satisfaction as Mr. Hepworth. He only trusted that, whatever might be said by anonymous critics, he would continue to hold the position for many years to come; for it was in the best interests of the Institute that he should do so.

Mr. R. HUNTER expressed his pleasure in seconding the motion. He said he could not add anything to what had fallen from Mr. Chester. All who knew Mr. Hepworth were quite aware that whatever duties were attached to the office would be efficiently discharged, and would be performed in a way which would give pleasure to everyone who came in contact with him.

The PRESIDENT, in putting the motion, said he should have felt it very difficult indeed to carry on the duties of his office if it had not been for the existence of the Honorary Secretary.

The motion having been unanimously carried,

Mr. HEPWORTH said he was exceedingly obliged by the vote of thanks, so cordially given, for the poor services he had rendered as Honorary Secretary. The office was created by the constitution of the Institute; and, at his suggestion, instead of its being made permanent, it was limited to five years—this also being under the condition of a yearly re-election. So that he came up to town naturally expecting that he should be displaced. It would not have been a matter of regret if he had been, because he had a great deal to do; and if someone would only have relieved him of the office, which he suggested many weeks before the letter referred to appeared, it would have given him a little more time and money to devote to other objects. Of course, the office of Honorary Secretary imposed some little self-denial. Nothing would have given greater pleasure to him—though, perhaps, not to anybody else—than to have taken part in the debate on some of the papers read; but he felt that there was not time, and that probably somebody other than the Honorary Secretary ought to speak. He had therefore to pass a self-denying ordinance upon himself from beginning to end. When the time came, he should be very glad for another Honorary Secretary to be appointed; but so long as he had the honour to hold this office, he should deem it, as he had done, a very great pleasure. It was a pleasure to render any service to the Incorporated Gas Institute. It was an Institute to which he was glad not only to belong, but to give such services as were in his power. He did not hesitate to say that he was the more pleased to render these services to the Institute because of the extraordinary and persistent criticism to which it had been subjected in the quarter referred to during recent years. He did not accept the fact that it was because The Gas Institute did this, or because it left undone that, that they were criticized. The fact was that they had committed the unpardonable sin—they had lived, and they had prospered; and he should never be one to apologize for his existence. He would try to justify it as well as he could. He did not, he hoped, say these things ungenerously; but sometimes one's feelings were stung by what might be regarded as unworthy criticism, coming repeatedly upon paltry details, of an Institute which, as far as he knew, never claimed to be infallible, although there might be other Institutions which were. He might add that to fair and reasonable criticism they must always be ready to give an ear. At all events, speaking for himself, he should always take in good part any criticism to which he was subjected—whether it were the letter of an anonymous writer, or from whatever other quarter it might come. He thanked the members cordially for the vote of thanks, and only wished he was more worthy of it.

The proceedings then closed.

PAPERS READ AT THE MEETING.

ILLUMINATING POWER AND ILLUMINATING EFFECT.

By THOMAS NEWBIGGING, of Manchester.

I do not propose to trouble you with a dissertation on the standard photometer; you will get that in the text-books. Besides, you are all familiar enough with the apparatus. Neither do I intend to discuss the relative merits of the various appliances now in use, or proposed, for determining the illuminating power of gas-flames. I will not even canvass the respective merits or demerits of the standard candle, the Carcel lamp, the Methven screen, or the pentane flame—whether of one candle or ten candles value; nor will I set before you a long array of figures, tabulated or other giving the results of elaborate investigations and tests o different qualities of gas and burners. All that is beside

my purpose on this occasion. I am going to speak of "Illuminating Power" in the abstract, and to give utterance to certain views—some will call them heretical opinions—that have been forcing themselves upon my mind for some years past, and which are clamouring for expression; the time, as I conceive, being ripe for such expression.

It is doubtless a truism to say that illuminating power and illuminating effect are by no means synonymous; that the two expressions do not convey precisely the same idea to the experienced mind, however much they may be considered as identical by the unenlightened public. The truth of this is vividly impressed upon us by observation of the illumination afforded by the electric arc light, where there is an intense central point, with a by-no-means proportionately great diffusive power.

But I venture to carry the illustration farther; I carry the war into the camp of illumination by coal gas. Take a gas of so-called 18 standard candle illuminating power, and another gas of 14 standard candle power. The one is nearly 30 per cent. higher in illuminating power than the other. But in burning the higher power gas for lighting purposes, do we, even with the most advanced appliances, and under the best attained conditions (assuming, of course, that these are applied in the case of both the gases), obtain the advantage, or a tithe of it, which the 30 per cent. superior power would lead us to expect? I am more than sceptical on that head—I am, indeed, convinced that we do not. I will go farther, and ask: "Do we, as consumers, not rather suffer grave disadvantages in burning gas of the alleged higher illuminating value?" I again assert that we do.

When gas of the higher standard power is deteriorated even to a trifling extent (as indicated by the usual photometrical tests) by reason of inefficient purifying materials or methods, the manifest loss in illuminating effect (as distinguished from illuminating power) is increased to a vexatious extent. Hence the frequent, or almost unceasing, complaints of "bad gas" that prevail within the zone where the assumed, or proved, higher qualities are in vogue. On the other hand, there is a marked absence of such complaints in districts where the lower standard illuminating powers are supplied and used.

To put the matter in a concrete form, take the circumstances of the majority of southern towns, where the lower power gas is burned, and compare them with those of more northerly towns, where the higher power gas is supplied. In the former, the complaints of deficient illuminating quality are almost entirely confined to the official gas examiner (where such official exists). This is notoriously the case in London, where the illuminating power usually ranges slightly over 16 candles. Complaints of this character in the Metropolis from the consumers themselves are exceedingly rare; and when they are made by consumers, they are groundless, or are due to defects of a local kind. My experience does not lead me to say the same of complaints in the richer (so called) gas districts. Here the official examiner generally finds the illuminating power up to and above the prescribed standard when the complaints from consumers are general and persistent, and when, as I hold, there is a real grievance. It would be invidious to give the names of places (they will occur to some of you), else my argument would receive immediate confirmation.

What is the reason of this? I will not answer the question by attempting to give an explicit scientific explanation of the phenomenon, except to assert that illuminating power, as indicated by present photometrical methods, is not synonymous with illuminating effect. The said scientific explanation is not, and never has been, forthcoming in any full and satisfactory sense; and it will only be arrived at after more consideration and research than have yet been devoted to the subject.

I am going to make a bold—some may consider it a rash—statement; but it is not made without very careful thought, and after long experience and observation—viz., that gas of 14 or 15 standard candle power gives, cost for cost, as good an illuminating effect as gas of 18-candle power. I go even beyond that, and assert that, under efficient pressure regulation, the lower (so-called) grade quality is the better illuminator. It is easier to burn a low standard gas to advantage than gas of a high standard. Another thing I can allege—that, whereas the higher quality gas is a nuisance under consumption, the lower quality is a positive luxury in use. The first is a nuisance by reason (amongst other things) of the invariable deposit of carbon—seen in the blackening of ceilings, and in other ways. True, there is a slight blackening, or rather browning, with the lower qualities; but it is infinitesimal as compared with the other, and is caused, not by unconsumed carbon, but by dust particles carried up by the heated air currents.

"Yes," I imagine someone saying, "and in this circumstance of the deposit of unconsumed carbon, you have the explanation of the difficulty—if it can be called a difficulty—which you have raised before us to-day. Consume the whole of the carbon contained in the richer gas, and your difficulty vanishes. It all, in short, resolves itself into a question of suitable appliances for burning the richer gas." Softly, my friend! I am not going to be put off with that ancient philter for allaying the ghost. I do not accept your conclusion, if that is the whole sum and substance of it. It is too obvious—so obvious that the most liliputian intellect can grasp it. There are more things in heaven and earth than are dreamt of in your philosophy. I used to wholly explain the thing in that brusque, self-sufficing way. I have ceased to so explain it; and I now come to you practical and hard-headed gas-makers and purveyors, and tell you that, if this is your ultimatum in the way of solution, it is not satisfactory to me, and I will not accept it as such. But again, will any objector to my statement be good enough to inform me what the proper appliances are for consuming high-power (say, 18 to 20 candle) gas in such a way as to get rid of defective lighting and abominable carbon deposit, with general unsatisfactoriness, and where they are to be found? I have never been fortunate enough to meet with them. On the contrary, the appliances most strongly recommended for that purpose are often just those which most aggravate the evils—dirt and dissatisfaction—of which I complain, and with good reason.

Having come thus far, let me rehearse the points I wish to enforce: It does not follow that to raise the illuminating power is to increase the illuminating effect. Illuminating power (as shown by the photometer) and illuminating effect are by no means synonymous terms. The higher the standard, the greater the nuisance, or risk of nuisance, of unconsumed carbon deposit on ceilings, furniture, and pictures. A low standard gas (say, of 14 or 15 candles), purified by lime, is equal in illuminating effect to the vaunted higher qualities of some places, with an absence of the nuisance of which I have spoken.

And now for the moral—though the story, like a good fable, should carry its own moral without the telling. The moral is that, during the last, say, twenty years, the public have been pursuing a mistaken course in clamouring for an increase (so-called) in the standard of illuminating power. What is wanted is a return to the lower (and better) standard—say, 14 or 15 candles (preferably 14)—with the actual supplied value approximating thereto, which, with the improved methods and appliances for burning gas, will afford a better illuminating effect than the other, with a blessed absence of nuisance. A further lesson taught us is, that the methods and instruments employed in coal-gas testing do not enable us to gauge the illuminating effect of the gas; and, lacking in that respect, to rely on their indications as a proof, and the only proof, of illuminating value, is misleading and mischievous. A photometer that will measure quantity of light as well as intensity—if the invention of such an instrument is possible—is much to be desired. These two old-world and suggestive terms, *quantity* and *intensity*, have, of late years, almost passed out of the gas-maker's vocabulary; but they greatly need reinstating, with all the pregnant facts and associations which surround them.

A yet further moral derived is, that enriching nostrums are a snare and a delusion. They are not necessary for effective lighting; they are a backward step in illuminating by means of coal gas. Given 14 or 15 candle gas, purified by lime, either wholly or as an accompaniment of purification by oxide of iron, in such manner as to completely eliminate the carbonic acid (for this is a *sine quâ non*), and I will back it against all the other higher photometrical qualities—back it to give more satisfaction and provide fuller illumination than the other. Given such 14 or 15 candle gas, consumed under proper conditions of burner and pressure, with ventilation to ensure the removal of the products of combustion, and you have a light which rivals,

in point of cheapness and general efficiency, if it does not eclipse, that of any other artificial illuminant.

I repeat that photometry as at present practised, with the instruments in use, and with the specific objects in view, is clearly at fault. Its results, or the way of stating these results, do not harmonize with every-day experience. I listen to the stories that are told of the enormous loss of light consequent on using what are described as unsuitable burners—I do not mean faulty burners, but burners that are said to be unsuitable for use with the particular quality of gas supplied—with incredulous wonder. We are assured, for example, that, tested by the standard photometer, even employing a good burner of the very best design and construction, if it be of the flat-flame type, in consuming gas of 14 to 16 candle power, there is a sacrifice of something like 40 to 60 per cent. of the available light, as indicated by the standard Argand. My experience, as a mere consumer of gas, putting orthodox tests aside, is not in accord with any such assertion. True, there may be a sacrifice of intensity in using the flat-flame, as contrasted with the standard Argand; but that there is any such sacrifice of quantity, of diffused power, of illuminating effect—of illumination, in short—I distinctly deny.

The flat-flame type of burner is assumed to be the best fitted for evolving the light-giving power of gas of 20-candle power; and hence it has been designated as the test burner for this and higher qualities. I venture to say, however, that complaints of want of illuminating power are more frequent where the two conditions of richness of gas and alleged suitability of burner are found to exist than under the other. The fact is that, for all, or most, qualities of coal gas, there is but little variation in illuminating effect in using the flat-flame burner. The physical conditions under which the flat-flame burner is sometimes used, rather than the chemical conditions of the gas, will generally account for any lack there may be of illuminating effect. But I know from experience that it is a fallacy to say that the flat-flame burner gives under test a higher value than the Argand with 20-candle gas and upwards. Anyone who cares to try may easily satisfy himself that Sugg's "F," or No. 2 Argand, gives photometrical results from 5 to 7 per cent. higher than the flat-flame with these qualities. These will probably be looked upon by many as heretical opinions. An acute writer has said, that, "a heresy is truth in the making;" and so I am consoled. I have not given expression to them without consideration. I venture to predict that they will not for long be viewed as heretical. The hour is at hand—if it has not already arrived—when the inevitable reaction against high standards and enrichment fads will begin; and then the truth of the philosophy underlying the views I have now expressed will be fully acknowledged.

The objections to all tried methods of enriching the gas derived from bituminous coal of average quality, excepting, perhaps, enrichment by means of cannel, are sufficiently serious to raise doubts, even in the minds of some of those who voluntarily resort to them, as to the alleged benefits to be derived from their adoption. The varying quality of the enriched gas, due to the stratification of the gases of different specific gravities, which takes place, notwithstanding the action of the law of diffusion, and the deposition of the hydrocarbon vapours in the distributing mains and service-pipes, are the principal drawbacks that are encountered—leaving out of question, for the moment, the disadvantages on which I have already dwelt. Professor Vivian B. Lewes, in the remarkable paper read by him at the Society of Arts on the April 11 last, and fully reported in the JOURNAL OF GAS LIGHTING for April 17, in dealing with this subject as it affects the gas supply of London, remarks: "The official testing-stations are fixed at the points where the great trunk mains deliver the gas to the districts to be supplied; and it is only under exceptional circumstances that the illuminating value of the gas is ever found to be below the required limit at these points. In these big mains, the gas is continually flowing at a fairly steady rate, and is neither exposed to any great alteration in temperature, nor, from the size of the mains, to any great amount of skin friction—*i.e.*, rubbing of the gases against the sides of the pipes. But as soon as distribution commences, both these factors come into play; and, as certain of the chief illuminants of the gas are vapours and not permanent gases, lowering of temperature causes condensation of some of them, while the power which friction against the sides of the mains and service-pipes, coated with deposited hydrocarbons, has of withdrawing the illuminants from the gas, still further decreases its light-giving value. Moreover, anywhere near the dead end of a service, stagnation in the gas during a large proportion of the twenty-four hours, when gas is not being consumed, adds still further to the trouble; and, even at the testing-stations, the influence of the small consumption of the gas on Sundays, and consequent stoppage in the manufacture on that day, can be traced in the illuminating value found on Monday morning." This is weighty evidence of the unsatisfactory results of enrichment, coming as it does from one well qualified to express an opinion, and deserves to be well pondered by all concerned.

It is urged that the cost of enrichment by means of the hydrocarbon oils is from two-fifths to one-half less costly than enrichment with cannel; but statements of this kind must be largely discounted, in view of the drawbacks mentioned. Some things, while apparently cheap, are dear at any price.

In the paper of Professor Lewes, already referred to, the question of the composition of gas enriched by carburetted water gas is dealt with in regard to the alteration in the size of the gas-flame by reason of the increase in the quantity of hydrogen and carbon monoxide, and the decrease in the percentage of methane in the enriched gas. This is worthy of attention as constituting a further objection to the use of enrichment processes.

Enrichment, unfortunately, in one form or another, is a necessity in places, owing to the action of Parliament in fixing an unduly high standard of illuminating power. But that any of the more northerly towns—say, in Yorkshire or Lancashire, whose standard is fixed at 15 candles and under, should resort to enrichment, is a piece of folly that may well be discouraged.

The truth in regard to high standards and enrichment processes is that, while the augmented cost per candle is serious in amount, the advantages derived in the direction of increased illumination, are trifling or *nil;* while at the same time they are accompanied by disadvantages that are very real. Enrichment to any great extent, even by the use of expensive cannel or shale, is to be deprecated. So far from resorting to enrichment, the wiser policy, as it seems to me, would be to reduce the illuminating value of the gas yielded by the richer coals and cannels, by a judicious admixture of the latter with inferior coals. The tendency of this would be to place the prices of coals on the one hand, and gas on the other, more on a level for the whole country, which would be an unmixed good. Why should cannel, for example, stand at such a high price? I do not think it is owing to the scarcity of cannel. Scarcity is a purely relative term. Most things are plentiful or scarce according as the demand for them rises or falls. The cost of winning cannel is no more, probably less, than that of winning ordinary coal. It is only an accident which has placed cannel beds in the hands of their proprietors, who by their possession are, under present conditions, enriched without corresponding benefit to the community at large.

The necessity for cheap gas is of the first importance in these days of competition. Cheapness is the best possible stimulant to the employment of gas for purposes other than lighting. The benefits to a town possessing a supply of cheap gas are incalculable, not only in a direct pecuniary sense, but from an industrial point of view, in the number of uses to which gas can be applied, and also as mitigating the smoke nuisance, and in this way contributing to the health and comfort of the inhabitants.

The unreasonably high standards prescribed in certain towns—as Liverpool, with 20 candles; Preston, with 18; Southport, with 20; Salford, with 18; Middleton, with 18; Wigan, with 18; and others similarly disadvantaged—are an evil both for the respective undertakings, and (in an especial degree) for the consumers.

Again, incandescent lighting is being developed, and I believe is destined to be a greater factor before long; and for this reason also, there is less need than ever to aim at high illuminating powers by means of enrichment. These are facts which I am convinced, will be recognized by the public and by the Legislature in the near future.

If anyone suggests that the fixing of a high standard tends to stimulate the invention and introduction of improved appliances for consuming gas so as to develop the highest power of which it is capable, then, whilst partially agreeing with him so long as the gas is produced

from coal without addition, I also assert that enrichment cuts at the very root of invention in this direction. It is, in fact, a clumsy and expensive method of attaining an end that may be arrived at by another and more desirable way.

The reasonable policy for the legislature—as Mr. George Livesey has declared, and as it seems to me—is to fix such an illuminating standard as the quality of coal available in a district will yield. Or in places where there is no bituminous coal in their neighbourhood, then the nearest available coal may regulate the standard. London and most of the southern towns, especially such as are situated on or near to the Coast, owing to their geographical position, use Durham coals (sea-borne), yielding gas of 14 or 15 candle value. That, therefore, is what may be called the natural standard for such places. In towns farther North, and drawing their supplies from the South Yorkshire and Lancashire coal-fields, an additional candle would not be seriously objectionable; though even here a 15-candle standard is more advantageous, even from the consumer's point of view.

I am by no means isolated in holding the views which I am now trying to propound. Mr. Livesey—to whom the gas interests (in which I include the interests of consumers not less than those of shareholders and administrators of gas undertakings) are so largely indebted, both for initiatory and progressive reforms and improvements—has suggested the reduction of the standard of illuminating power in the Metropolis to the natural standard justified by the use of Durham coal. This is a policy which if, and when, carried out, will redound to the advantage of all parties, and will add further to Mr. Livesey's great reputation as a gas adminstrator. Some other of our ablest and most experienced gas engineers and gas chemists cherish the same views in their secret hearts; and a few (notably Professor Lewes) have ventured to express them. What seems to have been wanted, is the creation of the opportunity of enabling gas managers generally to give full and unstinted expression to their opinions. I have tried to afford such an opportunity; and if there is not an eager and emphatic declaration in favour of the policy now advocated, I shall be disappointed.

A PLEA FOR DIFFERENTIAL CHARGES FOR GAS.

By George Anderson, of London.

I dare say it is within the experience of most of you to have heard of gas consumers saying: "I would burn more gas if it were cheaper;" and your ready reply would be: "No doubt; but you see the gas company cannot make an appreciable reduction in price to all the consumers, when only a few would probably increase their consumptions." In towns where the consumption of gas increases rapidly, a statement of the kind will not interest you much. In those, on the contrary, where the consumption of gas does not sensibly increase—indeed, where it may be declining—you *do* feel that, if you could reduce the price without sacrificing the interests of your company, you would like to do so, and please your customers. Indeed, gas companies do reduce the price before the profits warrant it, in the hope, often realized, that by increased consumption an equal profit will follow. Such, however, is not always the case, especially when times are dull.

Many gas companies have also supplied gas for cooking and other purposes at a price considerably below that charged for lighting, on the ground that much of it is used during daytime, when the mains are comparatively idle; and, in order to distinguish between the gas consumed for lighting and that used for other purposes, a separate meter has to be put in. Where there is meter-rent already, people do not take kindly to a system that will double it; and consumers have objected on this account. I am connected with several companies where of late years the consumption has not increased as of yore, and with one in which it has steadily declined for several years. This state of things led me to consider the matter. I knew the desire for cheaper gas, and the objection to a second meter; so I decided to meet the consumer on his own ground, and it is the object of this paper to describe and defend the mode I have adopted.

"You said you would burn more gas if you had it cheaper. You would perhaps cook by it, heat your rooms by it, possibly put up a gas-engine; and you might even add more lights. Well, I will meet you. I will let you have all the gas you use *in excess* of your former consumption at a big reduction of (say) a shilling per 1000 cubic feet. There will be no second meter, or other complication to annoy you. You can use the gas how you like and when you like, and put up more burners if you like. You will pay at the present price for gas up to the amount of your past consumption; and all you use in excess, you will have at a shilling per 1000 feet less." I have now had several years' experience of this mode of supplying gas in six towns; and, so far, it has acted to my satisfaction. It requires a little time to educate the consumers up to this system; but eventually they take to it.

I append a few instances:

Town A,	5	years,	31	per cent.	of the consumers.
„ B,	3	„	65	„	„ „
„ C,	1½	„	54	„	„ „
„ D,	1	year	32	„	„ „

Thus in these four towns we have an average of 45 per cent. of the consumers using more gas, and getting the extra quantity at a considerable reduction.

In one of these towns, I think the system helped to extinguish an electric light company, who for five years had lighted the chief streets, and had taken about a score of our consumers. During the last year of the electric lighting contract, we put up some lamps, with several gas-burners in each, to show what gas could do. The result was that we got back the whole of the street lighting, and the private consumers also increased their lighting; the result being that for last year the Company's sale of gas exceeded that of any of the 60 years of its existence. I will quote another case—that of a college which had used our gas for several years. The authorities decided on having a large additional building; and they had thought of a private electric lighting installation. But we are now fitting up the new building with 500 lights to burn gas; and they will get the extra quantity at the reduced price. Thus the ball rolls on.

I may mention another case—that of town D. Thirty years ago, the district was very much a residential one. The gas company paid a 5 per cent. dividend, which increased year by year until, for several years, they paid 10 per cent.; and during these years the works had been very much enlarged. In course of time, several factories were erected, and many of the best residents left. The factories were not successful, and some stopped; while in others the businesses were changed, and were again unsuccessful. All this made trade very dull with the shopkeepers, several of whom began to burn oil. The gas consumption declined, and so did the dividends of the company to 8 per cent. At this town the system was adopted a year ago; and already 32 per cent. of the consumers have increased their consumption. The price of gas there is 4s. 6d. per 1000 feet; the reduced price is 3s. 4d.—being a bonus of 1s. 2d. When the total consumption shall have sufficiently increased, our next move will be to reduce to 4s.—the low-priced gas remaining at 3s. 4d.—and so on in proportion to our success.

Let no one suppose that the low-priced gas is sold at a loss. Oh, no. There are what we call fixed charges, which remain much the same whether the business increases or diminishes. These include directors' fees, officers' salaries, rates and taxes, and leakage from the mains and service-pipes; and these vary from 6d. to 9d. per 1000 cubic feet according to the size of the works. In these figures I leave out leviathan works, where gas can be sold at 3s. per 1000 feet, and with a larger profit than in smaller works, though charging double the price. In many moderate-sized works, it requires 15d. to 18d. per 1000 feet to pay interest on capital. If our capital is partially idle, we lose this; we also have to pay the standing charges. Together these may be taken at 1s. 9d. to 2s. per 1000 cubic feet of gas sold. It therefore follows that selling extra gas at a lower price is still profitable. By the system I have described, our shareholders do not lose. Their dividend is not jeopardized as it would be by a reduction in price on all the gas; and this I consider to be of some importance. Our first duty is to conserve the capital placed in our hands; and the next, to do the best we can for our customers.

I should not have considered it worth my while to write this paper, had I not seen, in the pages of the Journal of Gas Lighting, that some of our revered authorities have taken the trouble to condemn the system described

therein; even going so far as to read before a select few a paper in which I thought the epithets were stronger than the argument (see JOURNAL, Vol. LXI., p. 871). I do not consider that there is anything divine about the system I have sketched. I know it is only human; and, like all human action, it is subject to improvement, and we shall be apt to adopt any change that will render it more perfect. But I ask those who condemn it what they would have done in case D.

Dull trade, which has prevailed now for several years, and cheap oil, have together reduced the business of many companies, and thrown a chill upon us. Are we to go to sleep in these times, and awake with a cramp in every limb? or shall we keep wide awake, and set our wits to work to improve the property placed in our hands? I prefer to do the latter. It is by increased consumption that we can reduce prices. I remember the time when the price of gas in London was 6s. per 1000 cubic feet; and all the Companies combined against, and tried to howl down, the late Alexander Angus Croll, who, in founding the Great Central Gas Consumers' Company, proposed to sell at 4s. But he did sell at 4s., and his Company paid maximum dividends; and all gas companies in the country, as well as the many thousands who are engaged in connection with gas accessories, have profited by his far-seeing policy and wise forethought. I daresay the Companies and their officers believed in the ruin they prophesied; but their notions were antiquated. They now see how wrong they were; for, chiefly through increased consumption, they now sell gas at less than 3s. per 1000 feet, and declare maximum dividends.

A statement has appeared, in the paper already alluded to, that the system I have described would do injustice to some consumers. My answer is that it is rare that, even in a combination of a few individuals, and certainly never in a nation, we can administer perfect justice to all. We have, to some extent, to be guided by what is expedient.

AN IMPROVEMENT IN THE CONSTRUCTION OF ATMOSPHERIC BURNERS.

By C. B. VOISEY, M.D., of Liverpool.

At the invitation of the Council of the Incorporated Gas Institute, I am afforded an opportunity of speaking upon a subject not without interest and importance to its members—the defect of "down-burning" or "lighting-back" in the ordinary atmospheric gas-burner, and the means which I and another have devised to obviate it.

Gas-heating is a luxury and convenience which modern civilization has placed at our disposal. Its advantages for occasional and intermittent warming are manifest to all; and from a sanitary point of view, a properly working and well-fitted gas-stove is just as good as a coal-fire. In the minds of many, however, there still survives a prejudice to its use, which is not founded on mere sentiment opposed to the supplanting of the time-honoured coal-fire with all its associations, by the introduction of any new device, but which is based on reasonable objections. In one case, it is because it is noisy; in another, because it is expensive. But the most pregnant objection of all is that it often emits a very unpleasant smell—an odour that is quite peculiar, and that is due to the burner having "lighted-back."

By "down-burning" or "lighting-back" is meant, as you know, that the gas instead of burning at the nipples, burns at the point where it issues from the gas-jet or nozzle. Under these circumstances, it does not receive a sufficient supply of air for complete combustion. The heating power of the gas is considerably diminished; the "fuel" is blackened; and acetylene (C_2H_2) and carbonic oxide (CO) are formed. The former is responsible for the offensive smell; and both, in any degree of concentration, are highly poisonous. It would be difficult to realize that, under the conditions in which these gases are developed, they should ever accumulate in a room in such quantity or degree of concentration as to produce any very serious effects; but it is not unreasonable to believe that, if inhaled frequently or for long periods at a time in a dilute form, they must exert some deleterious influence, more especially in a constitution already enfeebled by disease. This erratic action of the burner is most often attributed to a faulty chimney, one in which there are intermittent down-draughts—one just as unsuited for a coal-fire as for a gas-stove. But still they are numerous; and if a gas-fire were used in one, there is not the least doubt that the ordinary burner is very likely to fire-back with the first puff, and each succeeding puff will blow the incomplete products of combustion into the room.

It may be interesting to describe briefly what effects acetylene and carbonic oxide have on the human organism, and how they are produced. Sir Humphry Davy and others, experimenting on themselves, have proved that the inhalation of carbonic oxide causes headache, pulsation in the temples, giddiness, nausea, and great prostration leading to drowsiness and insensibility. This pathological sequence is occasioned by the direct action of the gas upon one of the cellular constituents of the blood—the red corpuscles. Internal respiration, as distinguished from pulmonary respiration, is effected by the agency of hæmaglobin—a highly complex chemical compound contained in the red corpuscles. This body is brought to the capillaries of the lungs in a reduced form; and it there absorbs, and combines loosely with, oxygen from the air. It is thence propelled by the heart to the various tissues, to which it delivers up the oxygen; and it is again conveyed to the lungs for a fresh supply. This alternate oxygenation and reduction of hæmaglobin is necessary to the vitality and functional activity of the tissues, and is continually taking place. Now hæmaglobin has a similar power of combining with, and a greater affinity for, acetylene and carbonic oxide; and oxygen is only able to displace them from their combination with very great difficulty. The tissues of an individual breathing these gases would not only be deprived of some of their oxygen, but would in addition be supplied with injurious substitutes; and according as more or less of the hæmaglobin was rendered unavailable for respiratory purposes, so would the symptoms be more or less severe. I am not aware that such severe symptoms have ever been known to arise from the use of gas-fires. But still atmospheric burners do very frequently light-back, and chimneys are often faulty; and under these circumstances it is no uncommon experience to hear complaints of headaches and nausea as a result. The symptoms are due to a palpable and clearly understood defect, which detracts from the value of the stove; and a knowledge that these are possible consequences of its use does considerably restrict the sales. There is every reason, therefore, why efforts should be made to remedy it.

"Lighting-back" in the ordinary burner may be caused by: (1) Down draughts playing upon the nipples and acting in a direction opposite to the current of mixed air and gas. "Lighting-back" only occurs when the force of the draught is sufficiently strong to reverse the direction of the current, and to blow the flame down the nipples. The ordinary burner is fairly safe when working full-on at a pressure of 10-10ths; but as the pressure is lessened, a proportionately less force is required, and at 4-10ths or 6-10ths it easily lights back. (2) Draughts playing upon the air-inlet and acting in the *same* direction as the current of mixed air and gas. This would appear to be by far the most common cause in operation; and it is extremely fatal to the efficient action of the burners at all degrees of gas pressure—almost as fatal at 10-10ths as at 4-10ths. In some cases the draught comes from the chimney, but more often from the front of the stove, and is caused by a passing dress or other moving object, the opening or shutting of a door, &c. In whatever way arising, the result is the same—the draught increases the velocity of flow of mixed air and gas, the percentage of air in proportion to gas is increased, the mixture is more readily explosive, and on the cessation of the draught the recoil draws the flame down the nipples and ignites the mixture. (3) Sudden variations of gas pressure. The *modus operandi* in this case is much the same as in the last. There is a temporary acceleration in the flow, succeeded by a recoil; and the flame is drawn into the mixing chamber. (4) Too small a gas jet or nozzle, or choking of the nozzle by dust or soot. (5) Insufficient gas, with too large a percentage of air.

The most important defects of the ordinary burner are: (1) That it is liable to be "lighted-back" by various disturbing influences even when "full on." (2) That it is incapable of working safely with a less supply of gas than is represented by 4-10ths pressure. (3) That it does not admit of the heat supply being regulated to a sufficiently low point.

Efficient action of Bunsen burners for laboratory purposes is secured by means that are not applicable to the atmospheric burners that are used in gas-fires. The interposition of a piece of fine metal gauze in the course of the air and gas current, or the regulation of air so as to preserve a certain fixed ratio between it and the amount of gas passing, are both objectionable—the former because the meshes are liable to be clogged by dust, and the velocity of the flow impeded so as to cause very sluggish flame; and the latter because it is complicated and liable to get out of order.

Without some such means, it is recognized to be impossible to sufficiently lower the point of minimum pressure; and hence all further attempts in this direction have been abandoned, and attention has been given to the development of the idea of using only a fractional part of the total number of flames, working at a pressure from the acquired minimum of 4-10ths upwards.

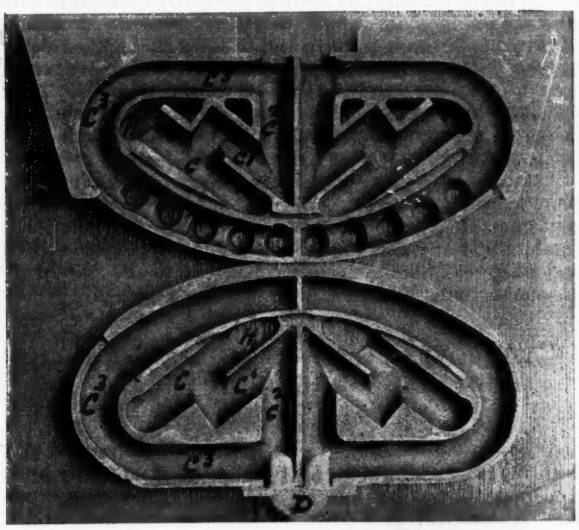
The outcome of these attempts are: (1) The "Duplex" burner; (2) the series of separate Bunsen burners each provided with a separate tap, as recommended by the Lancet Commission.

A means has recently been discovered of reducing the point of minimum safe pressure from 4-10ths to between 2-10ths and 1-10th, and is applied in the burner which I shall now attempt to describe. In the early part of last year, I was experimenting to determine whether it would not be possible to apply to the ordinary gas-fire burner the principle of the proportionate admission of air and gas in a manner not previously attempted. One experiment was as follows: A central air chamber (fed by two lateral tubes) was attached to the air-inlet of the burner, so as to embrace the tube and tap supplying the gas. On the plug of the tap were fixed two "wings," so arranged that when the gas supply was turned low, the "wings" should at the same time diminish the air supply proportionately. Though the outcome of the experiment was unsatisfactory, in that what was expected was not fully realized, it was satisfactory and interesting in that it demonstrated the fact that, though the burner did "light-back" by a down-draught with a slight explosion—but only after a much more severe test than is ordinarily required for the purpose—the flame subsequently righted itself at the nipples of the burner. After a little reflection, it occurred to me that the explanation of this phenomenon is that the carbonic acid resulting from the explosion in "lighting-back" was collected in the central chamber, and was afterwards sucked by the injecting action of the flame over the nozzle, and so extinguished the flame. Subsequent experiments were directed to apply this fact to the fullest advantage, and to neutralize the other causes of lighting-back.

The burner may be described as being compounded of two separate and similar burners placed side by side, to the air-inlets of each of which is attached an arrangement of tubes—all the parts being in the same horizontal flame and cast in one piece. The chief features of the invention are: (1) The dual character of the burner proper; (2) the attachment and peculiar arrangement of the tubes through which the air enters to the mixing chamber.

For the purposes of description, it will be convenient to speak of only one half; for what is said of one is equally applicable to the other. Each half is, roughly speaking, horseshoe shaped. Projecting from one end of the shoe, at the point where the gas and the air first come in contact, and at right angles to the direction of the mixing chamber, is the first part of the air-tube C^2, extending almost to the other end of the shoe. It there communicates at an angle of about 45° with the second part of the tube C^1, which extends backwards in an oblique direction to about the middle of the concavity of the horseshoe. It there communicates with the third part C, which has a direction parallel to the second part C^1, and stretches in an oblique direction completely across the concavity. This third part has two openings to the air, H and H^1—one (H) at the front on its under surface, the other (H^1) at the back of its upper surface. The gas is supplied to the two halves of the burner by the forks of the Y-shaped nozzle or jet D.

This construction was especially designed to obviate, as far as possible, the disturbing influence of draughts either upon the nipples or the air-inlets; and it does so in the following manner: If a down-draught from the chimney plays upon the nipples (cause 1), it blows the flame into the mixing chamber. A slight explosion then occurs, and the products of the explosion are blown into the tubes C, C^1, and C^2. The gas is now for the moment ignited at the nozzle; but the injecting action of the flame subsequently draws the carbonic acid stored in the tubes over the nozzle, and, extinguishing the flame there, allows the burner to right itself.



C C^1 C^2. Parts of Air Chamber for Storeage of Carbonic Acid, &c.
C^3. Mixing Chamber. D. Gas Jet or Nozzle.
H H^1. Air-Inlets. N. Nipples.

As already stated, the efficient action of the burner is most often disturbed not so much by draughts acting *against* (cause 1), as by draughts entering through the air inlets, and acting in the *same* direction with the current of mixed air and gas (cause 2). The outermost part of the air-tube C, besides assisting in the storeage of carbonic acid, has a special function of its own in counteracting this latter influence. Draughts or compressed air entering by either the upper or lower openings H H^1 rush straight through the tube C from the area of greater to the area of lesser pressure, diminishing instead of increasing (as they do in the case of the ordinary burner) the amount of air admitted to the mixing chamber C^3. So long, therefore, as they continue to act, the flame is luminous; but the burner does not "light-back."

On testing the burner, it was found that not only had the means adopted neutralized the influences of causes 1 (down-draughts) and 2 (draughts on the air-inlet), but also rendered it more tolerant of causes 3 (varying pressures) and 5 (too little gas and too much air). The only remaining cause is No. 4 (too small a nozzle). This is either a consequence of negligence in manufacture or of deposition of carbon from the burner having been frequently lighted-back. The former is remediable by care, and the latter does not occur in the case of the burner described.

The new burner is designed and constructed to resist all and only such disturbing influences as are likely to be met with in actual everyday use; and it is fairly claimed that it succeeds in doing this in a remarkable degree.

1. It is practically absolutely safe when working under pressures of from 2-10ths upwards. The lowering of the minimum point of safe pressure admits of a more extended and gradual regulation of the temperature than is possible by the duplex burner, and dispenses with the

necessity of using either it or the system of separate burners each with a separate tap, as recommended by the Lancet Commission. It is somewhat difficult to explain how the lowering of the minimum point of safety has been brought about. The flame from a supply equal to a pressure of 2-10ths has all the appearance as regards colour of that from a supply equal to 1 inch—it is neither more nor less luminous. The probable explanation is that the resistance offered by the shape of the tube to the entrance of air does proportion its amount to the quantity of gas entering the burner, and that this proportionate admixture is preserved through all degrees of pressure supply from 1-10th and upwards.

2. It is quiet in action.
3. It is simple in construction and inexpensive to make.
4. Any degree of power can be obtained.

The precautions necessary to be observed in fitting the burner in the stove or grate are: (1) That neither inlet of the tube C is covered; (2) that the way through the tube C is clear and unimpeded; (3) that the aspirating action of the flue or chimney is not allowed to exert its influence on the upper and posterior air-inlet.

If the tube or either opening is occluded, the draught is no longer able to rush through and diminish (so long as it continues to act) the air supply to the mixing chamber, but would enter C^1 and C^2 and cause "lighting-back" as readily as in the case of the ordinary burner. If the aspirating influence of the flue is brought to bear on the upper air-inlet, the air entering by the lower opening would be drawn straight through the tube, and, little or none entering the burner, the flame would become luminous.

There is one other matter upon which I should like to have made a few remarks and to have heard discussed—that is, as to how far the process of combustion of gas is modified by the condition (under which it is burnt in a gas-fire) of passing through red-hot fuel. The subject is an important one; but time will not permit of my dealing with it now.

A FIRST SEASON'S EXPERIENCE OF CARBURETTED WATER GAS.

By J. Stelfox, of Belfast.

I believe it is an open secret that the gas-works which I have the honour to control may fairly be allowed to compete for first place in the matter of congestion, with a very rosy chance of being awarded first prize! The enterprising citizens of Belfast have been so dazzled by "the light of the future" that they have been unable to realize the requirements of the present; so that for several years past every retort in the place has been in action for five or six weeks at midwinter, for seven days each week and twenty-four hours each day. As the result of strenuous exertion on the part of my official staff, the plentiful use of cannel, and the mercy of Providence—I will not attempt to say in what proportions these factors should be credited—we have for so far managed to keep the city alight. The anxiety thrown upon all responsible officers has, however, been very great; and I have had the most gloomy forebodings as to the future.

Three years ago I was permitted to commence the erection of a new retort-house on the only remaining bit of unoccupied ground—a corner which had been originally laid off for extension of purifying plant. I was anxious to make the most of this extension, as it seemed to be the last chance of increased gas production on the existing site. Accordingly, in preparing the plans, I arranged to carry the retort-house as far as the boundary-line of the ground would permit; and to build an annexe to this of barely half the width of the larger building. It was in my mind in this "extension house," the inside measurements of which are 60 feet by 31 feet, to make an installation of inclined retorts; and the dimensions of the building were in accordance with the views of the promoters of that system at the time. Later on there seemed to be a difficulty in getting retorts fixed in so narrow a house; and, while the subject was under consideration, I had the good fortune to make the acquaintance of Mr. A. G. Glasgow, who had recently arrived in this country with a view to the introduction of the Lowe system of making carburetted water gas, which is so extensively used in the United States. I need hardly say that, among various schemes I had thought of for increasing our production of gas, this system had not been overlooked. The reports which were available did not seem to warrant very sanguine anticipations of favourable working results, as compared with those obtainable with coal gas. The one advantage, however, seeming to rest with the newer method—viz., the large make of gas possible on a small floor-space—was of primary importance in my case. I had hoped for a yield of about 250,000 cubic feet per diem from the small bench of "slopers;" and when Mr. Glasgow offered a guarantee to produce 1,500,000 cubic feet per day on the space which this bench was to have occupied, and when I considered that, in producing this large volume of gas, not only would no coke be produced, but a quantity of that made in the adjoining retort-house utilized, the temptation was irresistible. I at once enlisted the sympathy of my Chairman, Mr. C. C. Connor, whose intimate knowledge on the subject of producer and water gas generally was most helpful; and the result was that in October, 1892, I was authorized to accept the offer of Messrs. Humphreys and Glasgow for the erection of the plant. The guarantee given us by the firm was that each of the two sets forming the installation should produce 750,000 cubic feet per 24 hours, of 24-candle gas, with a consumption per 1000 cubic feet of not more than 45 lbs. of coke (including boiler fuel) and 4 gallons of the oil known as Russian "Solar Distillate."

During the early summer of 1893, I began to feel uneasy as to the completion of the plant in time for use during the ensuing winter; and when September came, and not a single plate or rivet was on the ground, I gave up all hope. Mr. Glasgow, however, with characteristic determination, would not admit defeat. From about the middle of September, the material was sent in and erected rapidly, and in such a manner as to entitle Messrs. Piggott and Co., the contractors, to the most unbounded credit. By the second week in December, one set of the apparatus was practically completed; but the operating floor was unfinished, and I decided to endeavour to pull through the season without attempting to call the new plant into requisition. This determination was, however, destined to be upset. When the heaviest week of the year came to be faced, it found us with a full week's supply of the worst material which the prolonged coal strike had compelled us to purchase; and, though our gasholders were full on Monday afternoon, by Wednesday night they were almost empty. On the Thursday morning I had an interview with Mr. Glasgow, the result of which was that the completed set was lighted up at about 11.30 a.m., and by 5 o'clock we made our first run of the new gas. Unfortunately, owing to the discovery of a very serious leak in one of the pipes in the exhauster-house, we were unable to start the machinery, and after filling the small relief gasholder, which stores about 75,000 cubic feet, we were reluctantly compelled to cease work for the night. Next morning (Friday) we started about 10 a.m., and worked continuously until 5 p.m. the following (Saturday) afternoon. During these 31 hours, we made 1,100,000 feet of about 25-candle gas. As I drove home, taking the circuit of the business streets on my way—noting the brilliant lighting of the shops, and reflecting that but for the timely aid of the new plant, there would have been a condition of semi-darkness—I breathed my first benediction on the little stranger. My very earliest practical experience of water gas was thus the substitution of "A Happy Christmas" for one which had threatened to be dolorous in the extreme.

So much has been said and written about carburetted water gas, that it may seem unnecessary to illustrate or describe the apparatus. Nevertheless, in case any member present should not have had the opportunity of seeing a plant at work (a year ago that was my position), I venture to occupy your time for a very few moments in describing the simple method of operating it.

The apparatus* consists mainly of three vessels—generator, carburetter, and superheater. Coke in the generator is brought to a high temperature by means of a powerful blast produced by a fan or blower. The oxygen of the air, in contact with the heated carbon, combines therewith, forming carbonic acid, a portion of which in its passage through the deep fuel bed is reduced to carbonic oxide. These gases, with the nitrogen, pass into the carburetter, on entering which a supply of secondary air is afforded by means of a direct-acting valve, the result

* See p. 1227.

being the combustion of a part or the whole of the carbonic oxide (depending on the amount of air supplied). The products pass on to the superheater, at the entrance to which secondary air is also admitted so as to complete the combustion of the carbonic oxide (in case this has not been effected in the carburetter), the final products passing away through the stack-valve and flue. The carburetter and superheater are filled with chequerwork of fire-bricks, laid to leave about 2-inch spaces between the bricks, a few layers of iron bars being placed on the top of the bricks in the carburetter, as it was found that the latter became disintegrated by the action of the oil-spray. By the combustion of the carbonic oxide in the generator gas, this chequerwork soon attains a high temperature, which is regulated in the two vessels by the judicious use of the secondary-air valves. When a sufficient temperature has been reached (say, about 1700° Fahr.), the operation of blowing is suspended, the secondary air valves being first closed, and the main blast being subsequently shut down. Steam of about 100 lbs. pressure is then admitted into the generator, and the stack-valve closed. A very similar action to that of making the generator gas now takes place; the oxygen of the water combining with the carbon as carbonic oxide, and liberating hydrogen—the mixture of these gases in almost equal quantities forming "water gas" in the upper portion of the generator. This gas, having no illuminating power, enters the upper portion of the carburetter. Here a spray of oil, pre-heated by passing through a reservoir placed in the outlet of the superheater, is discharged on to the hot iron bars; the oil vapour thus produced being picked up by the non-illuminating water gas. The water gas thus carburetted passes on through the body of the carburetter, and subsequently through the superheater; the effect produced being the permanent "cracking" or "gasification" of the oil. On leaving the superheater, the gas forces a passage through a hydraulic seal in the small washer, and passes on through a scrubber (through which a stream of water flows) into the washer, and so on to the condensers. In order that the oil may be thoroughly utilized, the supply is cut off shortly before the expiration of the time of "running" or making gas; so that for the last minute or so of each run only plain water gas is made, which absorbs in its passage through the carburetter and superheater the last traces of oil left in these vessels. At the close of the run steam is shut off, the stack-valve opened, and the blowing once more resumed for a brief period. About once each hour, a fresh feed of coke is supplied to the generator—an operation which only occupies about half a minute; and twice in 24 hours the grate of the generator requires clinkering. This is the only portion of the work which is of a disagreeable character. A special gang of men come in to attend to it. The time occupied is about 15 minutes. The gas passes from the producer-house through a condenser, and is discharged into a regulating gasholder, from which it is taken by a special exhauster which forces it through the purifying vessels, and on to the holder.

The production of gas is remarkably rapid, as will be seen from the following details of two runs of seven and eight minutes' duration, with only one set working:—

	No. 1 Run. Seven Min. Cub. Ft.		No. 2 Run. Eight Min. Cub. Ft.
1st half minute	1064	..	982
2nd "	818	..	858
3rd "	818	..	818
4th "	736	..	777
5th "	736	..	777
6th "	736	..	736
7th "	736	..	736
8th "	736	..	572
9th "	572	..	572
10th "	572	..	531
11th "	572	..	531
12th "	410	..	410
13th "	328	..	205
14th "	164	..	205
15th "	..	..	205
16th "	..	..	205
Total make in run	8998	..	9120

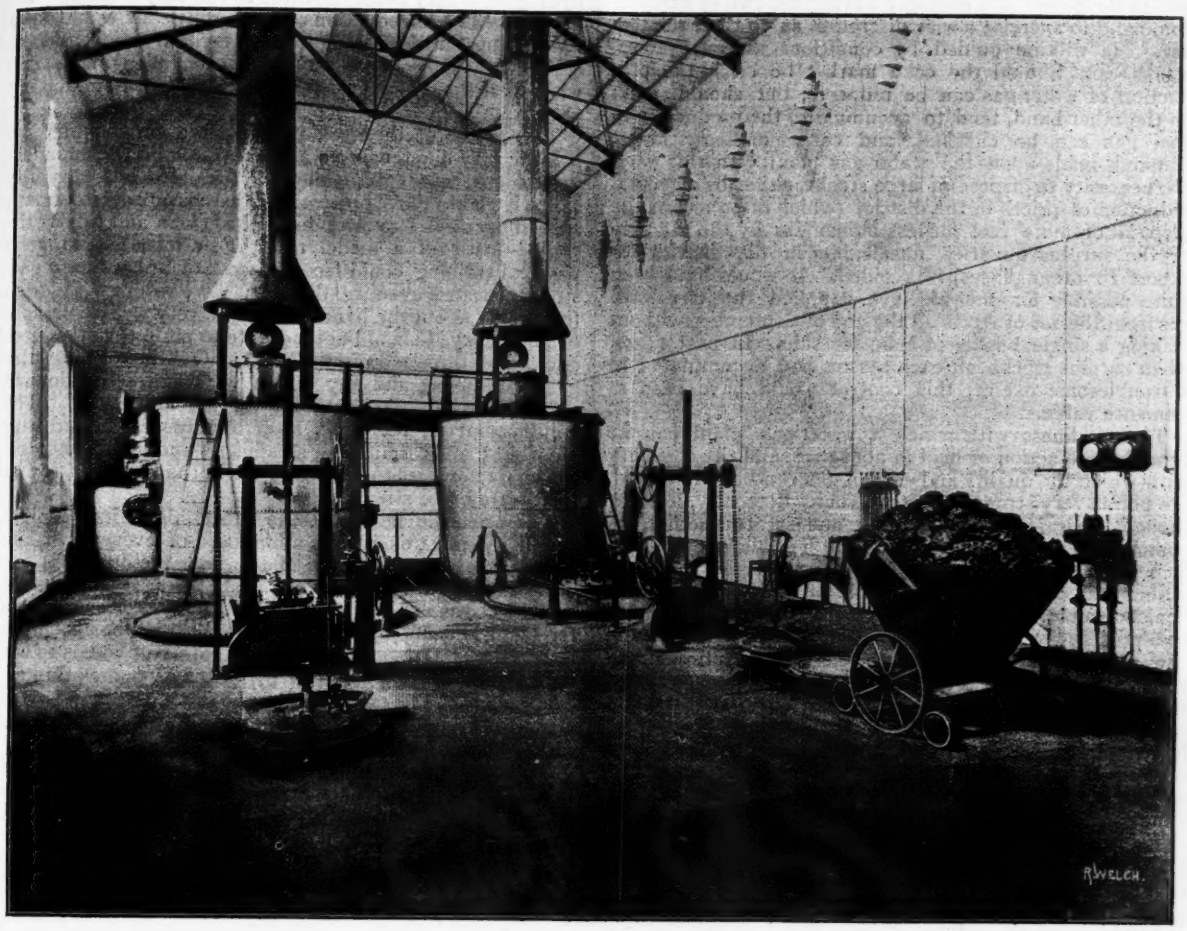
The question will be asked, "Has the system any advantages over that of coal gas?" I have no hesitation in saying that the advantages are numerous, though the extent to which they may be enjoyed will differ widely according to the geographical position of the district to be supplied, and the difficulties to be overcome in providing an efficient supply of gas. It will therefore be understood that I treat the subject as it is presented to me in Belfast, and must leave others to make the necessary allowance for local circumstances.

I begin with the convenience in obtaining a supply of raw material. We have provided two tanks, each 55 feet diameter and 36 feet high (which are about half a mile from the works), and one on the works of 30 feet diameter and 20 feet high, which cost, with concrete foundations, £3665. These tanks together hold about 1,160,000 gallons of oil, which will represent 386 millions of carburetted water gas of 20 candles illuminating power—equal to the production from (say) 45,000 tons of gas coal. This would represent 90 steamer cargoes of 500 tons each, to arrange for which would involve an immense amount of trouble even as regards mere freightage, as well as a constant worry in getting coal from the ships to the stores and thence to retort-houses. The latter task would require (assuming an hourly delivery of 40 tons) over 1100 hours of actual work of a filthy and laborious character. In my first cargo of oil, which weighed 1930 tons (the equivalent in gas yield of nearly 20,000 tons of coal), the cargo was discharged in 36 working hours by the steamer's pump, through two miles of 6-inch main; and no one but the harbour officials and our own knew that the vessel had come and gone.

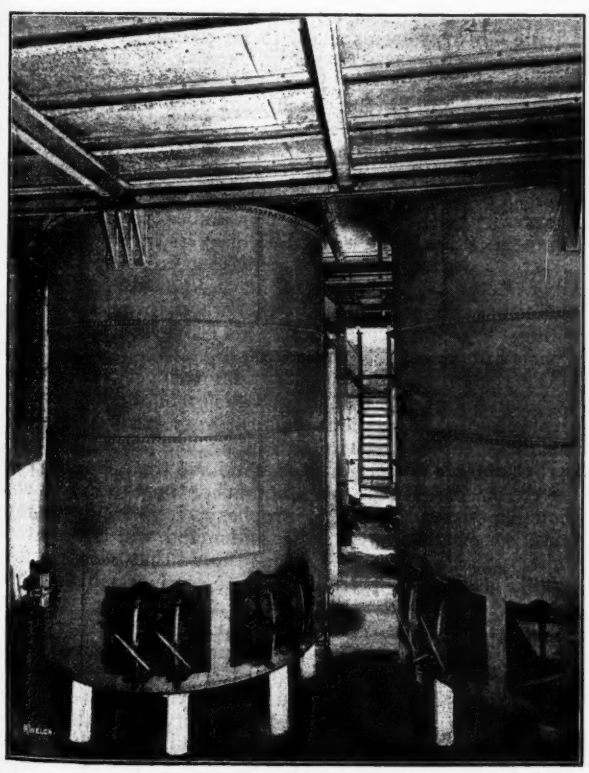
There is great economy of space required for producing plant, &c. Enlarging on figures already given, we find that 45,000 tons of coal would cover nearly 3 acres to a height of 15 feet. The equivalent in oil is easily accommodated in two vessels occupying barely one-fifth of an acre, including ample room all round the tanks. The space required for producing the water gas may be put down as one-fifth that needed for retort-houses. This estimate is most moderate, as from my own results I should be inclined to say that, at a pinch, the proportion might be taken as one to eight.

These figures deal only with the ground required for gas making. It must be remembered that there is no production of coke in the manufacture of water gas, and not only is the large extent of ground required for dealing with this important residual dispensed with, but a home market is provided for a portion of the coke produced in the coal gas apparatus—thus reducing the quantity for sale in the open market, and avoiding the necessity for lowering prices so as to get rid of stock. I assume that in the United Kingdom the manufacture of coal gas will always go on hand in hand with that of water gas in all cases in which the latter is installed, because, good anthracite coal being scarce and dear, the production of coke becomes a necessity. This being so, it is possible to so balance the use of the two processes that, if found advisable, only as much coke need be produced by one process as will provide the necessary carbon for the other. My short experience shows that, with good coal-gas settings, a production of 25 per cent. of coal gas and 75 per cent. of water gas would exactly balance, leaving no residual coke. These proportions could, of course, be varied or modified to any extent. I submit, further, that money spent in water-gas plant, which would be capable of being brought into use promptly in case of sudden emergency, would afford more relief than twice the expenditure on gasholders; and a further economy of ground space is thus rendered possible.

There is with water-gas appliances but a comparatively small outlay on capital account. Complete manufacturing plant for the production of 2 million cubic feet per day of carburetted water gas, including machinery, boilers, buildings, plant, chimney, tar settling vessels, scrubbers, &c., all complete, can be provided for £12,500. A new stage-floor retort-house for producing that quantity of coal gas, and including drawing and charging machinery, has been lately completed at the Belfast works at a cost of upwards of £28,000, to which must be added, for comparison, the cost of boilers and scrubbers. To keep on the safe side, I will take it that the saving in outlay on plant for producing that quantity of gas is £15,000, the interest on which sum, at 4 per cent., amounts to £600 per annum. Assuming that the apparatus would be at full work an average of 180 days in the year, the gas made by a plant of this capacity would be 360 million cubic feet per annum, on which the £600 per annum would be 0·4d. per 1000 feet in favour of the water gas. The further economy in coal storeage must not be overlooked. I suppose that three months' supply at maximum consumption would not be



THE "LOWE" WATER-GAS PLANT AT THE BELFAST CORPORATION GAS-WORKS.



too much for safety (though doubtless many managers have to put up with less), and with a plant of the extent mentioned above, this would represent for oil an outlay of £1800, and for coal, if substantial sheds are to be provided, at least £18,000. The interest on the difference, calculated at 4 per cent., would come to 0·43d. per 1000 feet. If to these economies we add the value of the difference in ground space required, we may safely assume that there is a saving in interest on capital of quite 1d. per 1000 feet in favour of water gas.

When there is anything like a good demand for coke, an enhanced price is obtainable for that residual by the use of water gas. In my own case, since early in the spring I have been able to sell all the surplus coke at about 18s. 6d. per ton; the price paid for coal being on the average about 15s. per ton. This result was mainly due to the fact that, while producing about 60 tons less coke per day than in former years, we were at the same time using in the water-gas plant about 18 tons per day. We had thus about 78 tons per day, or upwards of 500 tons per week, less to dispose of. The extra receipts thus obtained for coke will, in due course, go to the credit of the coal account. It is, however, quite certain that the increased price (2s. 6d. per ton) would not have been obtained but for the use of the new process. As each ton of coal yields, for sale, more than 10 cwt. of coke, the extra price obtained represents at least 1s. 3d. for the coke from each ton of coal, or 1·5d. per 1000 feet of coal gas made.

Of course, it must not be forgotten that, in operating a water-gas plant, we become ourselves customers, as it were, to our coal gas department; and though, by our operations as water-gas makers we are entitled, as already stated, to the credit of the extra price realizable for coke, according to our books this credit would go to the coal gas accounts, and we should be called upon to pay the increased rate if the enhanced price of the fuel is to be fully realized. It is therefore difficult to put a value in figures on the benefit to be derived from the use of the former process—the more especially because, as the price of coke is raised in this way, the quantity for sale is diminished. We may, indeed, so far extend the water-gas plant as to use up all the surplus coke from the coal gas, in which case there could be no claim that we had effected any extra profit in respect of coke sales. The point which I wish to emphasize is, that it would be

within the power of a manager having the two systems at command to exercise a wise discretion as to their relative use. He will be guided by conditions, seasons, prices, stocks, &c. Should the coke market be brisk, the production of water gas can be reduced; but should stock, on the other hand, tend to accumulate, the production of coal gas can be checked, and correspondingly larger demands made upon the water-gas plant. In this way, the necessity to dispose of large stocks, either by a general reduction of prices in the district (which often means the disposal of more fuel for less money), or by the sacrifice of the surplus quantity unsaleable in the district for export to other places, is avoided. It would have been quite possible for me to have supplied the city with gas from the 1st of April till the end of September without making a single bushel of coke for sale. In past years, when surplus stocks left each season had accumulated to a troublesome extent, this control would have been of immense value.

The readiness with which a water-gas plant can be brought into action or held in abeyance, and the certainty with which the quality and yield of gas can be maintained, are points very strongly in its favour. Recently, it being thought desirable to change from one set to another, we commenced to blow on the off-set at 11.30 a.m.; and by 3.30 p.m. we were making gas—thus bringing into use within four hours a plant capable of giving upwards of 800,000 cubic feet per diem. With still greater facility, the process of gas-making is suspended. By keeping the plant only partially in use at ordinary times, and reserving its full power for periods of sudden emergency, the maintenance of a full supply is ensured more certainly, as I have already said, than by additional gas-holder storeage. There would, of course, be some extra cost for coke in this method of working, but not to an extent at all equivalent to the advantage gained in the control of the daily make of gas.

As to the regulation of the quality of the gas, the system is perfect. Most of us know too well the difficulty of securing this important end in ordinary works when coal is not quite up to the mark, or heats are down, or it is pay-night, or the exhauster man has been too much in earnest. With water gas plant, there can be no over-drawing; the material used is from day to day the same; the required heat is easily maintained in the vessels; the oil for each "run" is accurately measured in; and the quantity can be at once increased or diminished. Thus we can change from (say) 18-candle gas to 30-candle gas in a few minutes, not by the substitution of an expensive article, such as cannel, for a cheaper one, such as coal, but by the use of a little more of the same article; and, whereas in the former case the change in quality must of necessity be slow, in the latter it is immediate.

In this connection, and without desiring to anticipate the question of the cost of the finished gas, to which I shall refer later on, it may be well to compare the cost of enrichment by water gas with that by cannel. Figures will vary according to circumstances; but I think I am safe in assuming that (in England and Ireland at least) the cost of each candle power produced by the use of cannel is more than double that of a candle obtained from a good coking coal. My own experience would lead me to put the difference as 2·5 to 1. Assuming that coal gas (with a small admixture of cannel) can be made of 17-candle power for about 13·5d. per 1000 cubic feet into the gasholder, which is the result of my own working, I should have to put on at least 1·75d. for each candle added to the illuminating power by the use of cannel. Thus the cost of 24-candle power gas into the holder would be increased by 12·25d. per 1000 feet. The same difference in illuminating power could be made up in the case of water gas by the use of an extra gallon of oil per 1000 feet, costing 2·5d. It is thus evident that the tendency of the use of water gas is to increase the standard of illuminating power of gas supplied. It is also probable that the usual ideas as to purification are likely to undergo a change. The necessity to eliminate carbonic acid, when its presence means the loss of 2 candles of illuminating power which have to be made up by cannel, cannot for a moment be doubted. Where the retention of the impurity only means the use of a very small extra in oil, or the reduction of the illuminating power from say 24 to 22 candles, the question assumes a vastly different appearance. As the impurity in carburetted water gas includes but a very small quantity of sulphuretted hydrogen, it may seem desirable to use only oxide in purification. The introduction of a very little air would keep the sulphur purifiers going for an indefinite period, and the carbonic acid would pay for its enrichment with oil; whereas if the enricher were to be cannel, it would be out of the question.

The nature of the work in the operation of water gas plant is very different from that required in the manufacture of coal gas. A member of the press has very fitly called it "a kid-glove process." There is no severe labour; and an operator may keep himself as clean and tidy as the engine-driver of a model mill. Few men not in good physical training could face the work of an ordinary gas-stoker, because even if "the spirit were willing" the flesh (especially about the hands) would be very weak. In case of emergency, I should not hesitate to undertake the work allotted to three men in the ordinary routine of the water gas operations; and any active workman could do, and continue to do, the same for an indefinite time. The employment is, therefore, open to any man of ordinary physique; and carefulness, steadiness, and intelligence are the characteristics to be looked for in the operator, rather than mere brute strength.

The scientific beauty of the process, and its absolute simplicity, must excite the admiration of everyone. The smoke, flame, and steam of the ordinary retort-house are quite dispensed with; and one is apt to forget that a great volume of gas is being produced in the quiet corner where the plant is being operated. The oil, which has been put into tanks at Batoum or Philadelphia, never comes to the light again, but is passed on by means of pumps through every stage. The crudeness of the ordinary operations of a gas-works are strikingly noticeable after seeing the new form of plant at work.

To the responsible manager, it will be a great relief to think that the system is one of simple gas-making. He is relieved of the business of the coke merchant; and, with the exception of a small quantity of tar (amounting to about 10 to 15 per cent. of the oil used), the whole of his raw material is converted into gas, and placed straightway to his credit on the consumers' meters. When we remember that residuals as a rule give far more trouble to a manager than all the rest of his work, the absence of this worry cannot but be regarded as a valuable lightening of his responsibility. Among minor advantages, the naphthalene difficulty seems likely to be completely solved by the use of water gas.

The saving in labour is immense. Working only eight-hour shifts, and giving each man only one set, each operator will make from 250,000 to 300,000 cubic feet; so that, to produce 6 million cubic feet per diem, the services of 20 to 24 operators would be required. To make this quantity of coal gas, we last season employed 340 stokers. In submitting these figures to an assembly of gas managers comment is, I think, needless. I may, however, go farther than this, and say that any willing man could operate two sets; and as the work is light, he could easily continue to work twelve-hour shifts. In this way, it would be quite within the power of eight active men to operate plant producing 6 million cubic feet per day.

We must not forget to consider the very important question of the possible and probable price of oil; for upon this important factor depends to a very great extent the future of carburetted water gas. Some people contend that the larger demand for oil will have the effect of raising the price. My own opinion is contrary to this; and, though I do not profess to prophesy, I will submit my reasons for believing that a large demand will reduce the selling price. It must be borne in mind that petroleum—especially Russian petroleum—is a product which flows naturally from the earth, and, on the spot, it is of no real value. It is said that at Baku it is much cheaper than water. The cost is therefore made up of: Cost of refining; carriage to seaport; freight; profit.

The Solar oil, so far chiefly used in water-gas making, has been hitherto a waste product, coming between the kerosene and the lubricating oils, and no provision has therefore been made for transmitting it to the place of shipment. With increased demand, means to effect a great saving in transit would undoubtedly be adopted; and if the traffic were to grow to such dimensions as to warrant the laying of a pipe-line, the economy, as compared with present methods, would be very great. Then tank-steamers to carry oil have been few; and very large freights have

been obtained. Increased demand for oil will bring about competition in this respect also; so that, as regards both transit on land and freight, there is every reason to expect a considerable reduction; and, as the Solar oil appears to have no value save for the purposes of gas making or boiler firing, it is not likely any action will be taken calculated to check the sale. I have referred to the Russian product because I am more familiar with the facts concerning it than with those affecting the American distillate; but, doubtless, similar considerations will operate in connection with the latter. At any rate, so long as the price of the one keeps down, the other must follow or lose its market. I think, on these grounds, it is reasonable to expect that the price of suitable oil will be lowered, though I am not disposed to look for a supply of refined petroleum at 1d. per gallon—a price stated to be quite within the range of possibility by an American Consul in Russia, whose views were given at length in the columns of the technical papers a few months ago.

But no matter how nice the process may be, it cannot be expected to make its way unless it can show a commercial claim for its existence. I therefore present for your information such results as, during my short experience, I have been able to obtain. In the preparation of these, I have endeavoured to avoid even the faintest semblance of "making a case" for the claimant. On the contrary, I have discarded many slight advantages which, together, would form an important factor in judging of the value of the system; believing its merits are so great as not to require the enumeration of every trifling matter in order to establish its claim.

During the period which has elapsed since its introduction into this country, it has been very difficult, if not impossible, to obtain reliable information as to its cost—in fact, until a month ago, the only definite pronouncement on the subject was contained in the paper of Messrs. Goulden and Paddon in 1892. The former gentleman having publicly said that the statement therein given as to the cost of production was not to be relied on—it having been obtained under unfavourable conditions, and with unsuitable materials—one would have expected that it might have been allowed to rest in the grave to which its author had consigned it. This, however, was not to be; and, on various occasions, it has been "resurrected," and taken about in the dim light which has till recently surrounded it as a "bogey." Only a month ago, this thrice-laid ghost was treated to another "dander;" but this will surely be the last, as it would scarcely be decent to raise it again after the funeral service solemnly performed over it by Mr. Paddon on the occasion referred to.

It would be manifestly unfair to charge the system with what we may call preliminary expenses. Of course, in the early stages of all undertakings, there must be extra expenditure—such, for instance, as the employment of two or three men to do the work of one, in order to secure trained hands. The figures which I give are derived from experiments arranged as follows.

A gasholder, of a million and a half cubic feet capacity, was specially laid off for the reception of the water gas. The working of the plant was stopped, so as to admit of the measurement of the oil in the tank. The make of gas was then proceeded with, and continued until the gasholder in question was full, when work again stopped, and the contents of the oil-tank were again ascertained. The gas was subsequently tested continuously while passing from this gasholder to mix with the general supply. The coke used is charged at 15s. per ton, which was the price realized when the system was started.

I regret that the figures pertaining to the fuel account are not as satisfactory as I could have wished, either as regards the supply to the generator or to the boiler. With respect to the former, it is only fair I should state that much more economical results were obtained prior to the period of making these special experiments. The change has been produced by alteration of the steam supply pending the fixing of a new form of grate in the generator; it having become apparent that the one at present in use causes a cutting action in the fire-brick lining at certain places near the cleaning-doors. In connection with the change in volume of steam, it was also thought desirable to make but one down-run in eight, instead of one in three, which is the ordinary method of working. Further, owing to a slight leakage in the oil-heater, the oil has been supplied cold, instead of being pre-heated. There is not a shadow of doubt that we shall not only accomplish as good fuel results in the future as in the past, but shall excel them. Nevertheless, as the trials were specially arranged, I have thought it right to make my calculations on the figures actually obtained.

As affecting the boiler fuel, we have not yet had the boilers or steam-pipes "lagged," as I preferred to wait till all the work had been thoroughly tested. As regards the character of the fuel used, I may say that it has been of varied quality, including common Scotch slack, unscreened breeze, the pickings of the generator refuse, and even pan breeze from the stokeholes of coal-retort settings. In addition to all this, our feed water heater gave way; and as, unfortunately, I had not duplicated the fixture, the feed has been cold throughout all the experiments. With this mention of drawbacks, I now submit the results obtained:—

Experiment No. 1.—*Russian "Solar Distillate."*

[From 3 p.m. on April 23 till 11 a.m. on April 25—44 hours.]

Gas made	1,507,000 cub. ft.
Oil used (3·977 gallons per 1000 cubic feet)	5,994 gallons.
Illuminating power (average of 23 tests)	26·22 candles.
" per gallon of oil	6·593 "
" " per 1000 cubic feet	1318·6 "
Coke used for generator	57,484 lbs.
" " per 1000 cubic feet	38·14 "

Cost of Gas.

Oil, 5994 gallons, at 2·5d.			£62 8 9
Coke, 25 tons 13 cwt. 1 qr., at 15s.	£19 5 0		
Less 2 tons 10 cwt. generator refuse (valued at the same price as breeze), at 4s. 6d.	0 11 3		
		18 13 9	
Boiler fuel. (Record lost; taken same as No. 2)		2 6 9	
Wages—			
Operators . . . 5½ shifts, at 5s. 6d.	£1 10 3		
Boiler men . . . 3⅔ " " 4 0	0 14 8		
Exhauster men . 3⅔ " " 4 6	0 16 6		
Coke men . . . 3⅔ " " 3 0	0 11 0		
Clinkering . . . 2 days " 5 0	0 10 0		
		4 2 5	
			£87 11 8
Cost per 1000 cubic feet for above items			13·95d.
" Water (by meter)			0·10
" Purification (estimated)			0·50
" Wear and tear "			0·50
			15·05d.
Less value of tar (15 per cent. on quantity of oil, at 1·25d. per gallon)			0·74
Net cost of gas per 1000 cubic feet into holder			14·31d.

Experiment No. 2.—*Russian "Solar Distillate."*

[From 3.17 p.m. on May 18 till 1.16 p.m. on May 20—46 hours.]

Gas made	1,499,000 cub. ft.
Oil used (3·10 gallons per 1000 cubic feet)	4,599 gallons.
Illuminating power (average of 33 tests)	20·445 candles.
" per gallon of oil	6·66 "
" " per 1000 cubic feet	1,332 "
Coke used for generator	61,872 lbs.
" " per 1000 cubic feet	41·27 "

Cost of Gas.

Oil, 4599 gallons, at 2·5d.			£47 18 6
Coke, 27 tons 12 cwt. 1 qr. 20 lbs., at 15s.	£20 14 5		
Less 4 tons 0 cwt. 1 qr. 16 lbs. generator refuse (valued at same price as breeze), at 4s. 6d.	0 18 1		
		19 16 4	
Boiler fuel—			
5 tons Scotch slack, at 8s.	£2 0 0		
1½ tons unscreened breeze, at 4s. 6d.	0 6 9		
		2 6 9	
Wages (time taken as 48 hours)—			
Operators . . . 6 shifts, at 5s. 6d.	£1 13 0		
Boiler men . . . 4 " " 4 0	0 16 0		
Exhauster men . 4 " " 4 6	0 18 0		
Coke men . . . 4 " " 3 0	0 12 0		
Clinkering . . . 2 days " 5 0	0 10 0		
		4 9 0	
			£74 10 7
Cost per 1000 cubic feet for above items			11·93d.
" Water (by meter)			0·10
" Purification (estimated)			0·50
" Wear and tear "			0·50
			13·03d.
Less value of tar (15 per cent. on quantity of oil, at 1·25d. per gallon)			0·57
Net cost of gas per 1000 cubic feet into holder			12·46d.

Experiment No. 3.—*Russian "Solar Distillate."*

[From 10.45 a.m. on May 24 till 10.52 a.m. on May 26—48 hours 7 minutes.]

Gas made	1,496,000 cub. ft.
Oil used (3·138 gallons per 1000 cubic feet)	4,694 gallons.
Illuminating power (average of 25 tests)	21·5 candles.
" " per gallon of oil	6·851 "
" " per 1000 cubic feet	1,370 "
Coke used for generator	62,188 lbs.
" " per 1000 cubic feet	41·57 "

Cost of Gas.

			£ s. d.
Oil, 4694 gallons, at 2·5d.			£48 17 11
Coke, 27 tons 15 cwt. 1 qr., at 15s.	£20 16 5		
Less 5 tons generator refuse (valued at the same price as breeze), at 4s. 6d.	1 2 6		
		19 13 11	
Boiler fuel, 14 tons 15 cwt. generator refuse, at 4s. 6d.		3 6 4	
Wages (same as No. 2)		4 9 0	
		£76 7 2	
Cost per 1000 cubic feet for above items		12·25d.	
„ Water (by meter)		0·10	
„ Purification (estimated)		0·50	
„ Wear and tear „		0·50	
		13·35d.	
Less value of tar (15 per cent. on quantity of oil, at 1·25d. per gallon)		0·59	
Net cost of gas per 1000 cubic feet into holder		12·76d.	

Experiment No. 4.—*American Distillate.*

[From 12.50 a.m. on May 27 till 11 p.m. on May 28—46 hours 10 minutes.]

			£ s. d.
Gas made		1,437,000 cub. ft.	
Oil used (3·234 gallons per 1000 cubic feet)		4,648 gallons.	
Illuminating power (average of 21 tests)		21·65 candles.	
„ „ per gallon of oil		6·695 „	
„ „ „ per 1000 cubic feet		1,339 „	
Coke used for generator		59,575 lbs.	
„ „ per 1000 cubic feet		41·46 „	

Cost of Gas.

			£ s. d.
Oil, 4648 gallons, at 2·5d.			£48 8 4
Coke, 26 tons 12 cwt., at 15s.	£19 19 0		
Less 5 tons 15 cwt. generator refuse (valued at the same price as breeze), at 4s. 6d.	1 5 11		
		18 13 1	
Boiler fuel, 11 tons 5 cwt. unscreened breeze, at 4s. 6d.		2 10 8	
Wages (same as No. 2)		4 9 0	
		£74 1 1	
Cost per 1000 cubic feet for above items		12·368d.	
„ Water (by meter)		0·100	
„ Purification (estimated)		0·500	
„ Wear and tear „		0·500	
		13·468d.	
Less value of tar (10 per cent. on quantity of oil—American—at 1·25d. per gallon)		0·400	
Net cost of gas per 1000 cubic feet into holder		13·068d.	

Experiment No. 5.—*Refined Kerosene (Russian).*

[From 1 p.m June 11 till 9.30 a.m. June 13—44 hours 30 minutes.]

			£ s. d.
Gas made		1,496,000 cub. ft.	
Oil used (2·95 gallons per 1000 cubic feet)		4,414 gallons.	
Illuminating power (average of 25 tests)		21·47 candles.	
„ „ per gallon of oil		7·28 „	
„ „ „ per 1000 cubic feet		1,456 „	
Coke used for generator		65,540 lbs.	
„ „ per 1000 cubic feet		43·87 „	

Cost of Gas.

			£ s. d.
Oil, 4414 gallons, at 2¼d.*			£41 7 7
Coke, 29 tons 5 cwt. 0 qr. 20 lbs., at 15s.	£21 18 11		
Less generator refuse (valued at the same price as breeze), 3 tons 19 cwt. 1 qr., at 4s. 6d.	0 17 10		
		21 1 1	
Boiler fuel, 9 tons 18 cwt. slack, at 8s.		3 19 2	
Wages (same as No. 1)		4 2 5	
		£70 10 3	
Cost per 1000 cubic feet for above items.		11·31d.	
„ Water (by meter)		0·10	
„ Purification (estimated)		0·50	
„ Wear and tear „		0·50	
		12·41d.	
Value of tar not ascertained		—	

In the foregoing calculations, I have made no allowance for supervision or management, and no doubt there will be from time to time trifling expenses which, to a small extent, may affect the accuracy of my figures. On the other hand, I am aware that there are economies to be effected which may be fairly set against these unknown possibilities. Thus not only the fuel account, but the cost of wages, would be relatively less if the full plant were at work, and less again with a more extensive plant. The conclusions I have formed, and which I now submit are warranted by the figures, are—

(1) That carburetted water gas of 21-candle power can be produced for less money than 17-candle coal and cannel gas, *and this without taking into consideration the saving in interest on capital and the increased revenue from coke*, not to speak of the many advantages and conveniences to which I have not ventured to attach a money value.

(2) That the enrichment of water gas within the range of from 17 to 26 candles, or even higher, can be effected at a cost of *not more than* 0·33d. per candle.

* This experiment was made in consequence of refined kerosene being offered at 2¼d. per gallon.

Before closing, let me say that I have carefully avoided any reference to other systems of gas making and enrichment, because I wished to confine myself to the subject of my paper. It must not be assumed from this that I am in any way prejudiced against these methods, or that I fail to recognize their merits. In one respect only do I consider at least one of them as inferior in usefulness to that of carburetted water gas; but the reservation is a very important one. It is that, whereas all the other systems are mere enrichers of gas, water gas is seen at its best when quantity as well as quality is required. A large power of enrichment by the use of retorts making a small quantity of 90-candle gas would not do much to help us through a week of darkness and scarcity of gas. At such a time, a large volume is the one thing needful; and if this can be had promptly, and of a quality of anything up to 30 candles, the benefit of enrichment is obtained to a considerable extent, along with an enormously increased supply. On this ground, therefore, I believe carburetted water gas holds the field against all comers; and, given a supply of oil at not exceeding present prices, it is bound to have a prosperous future.

The Estate of the Late Mr. W. Haywood.—The gross value of the personal estate of the late Mr. W. Haywood, Engineer to the Commissioners of Sewers of the City of London, has been sworn at £42,606 gross and £29,958 net.

Society of Arts.—The annual *conversazione* of the Society took place last Friday evening at the Imperial Institute, and was attended by about 3000 ladies and gentlemen. The Company were received by the Chairman (Sir R. E. Webster, Q.C., M.P.) and other members of the Council. The principal galleries were thrown open to the guests; and the gardens were specially illuminated. Selections of music were played during the evening by the Blue Hungarian Band, and the bands of the Grenadier Guards and Royal Artillery.

Masonic.—The "Emergency Meeting" of the Evening Star Lodge, during Gas Institute week, was duly held on the 18th inst., at the Holborn Restaurant. About 120 members of the Lodge and of visiting brethren assembled to offer "fraternal greetings" to the President of the Institute, and to witness the initiation of Mr. F. G. Burfield, the Secretary. The W. M. (Bro. J. S. Tamburini) carried out the duties of his office in an eminently satisfactory manner, both during the working of the Lodge and afterwards at the dinner which was served in the Venetian Saloon. The performance of the Meister Glee Singers was also much appreciated.

The Monier System of Construction.—Reference has on several occasions been made in our columns to the system of construction invented by M. Monier, and developed by Herr Wayss, an engineer and architect of Berlin. It was fully described in the Journal for Dec. 8, 1891; and it was brought under the notice of the members of the Midland Association of Gas Managers two years ago. It consists, as our readers may remember, of a combination of cement or cement concrete with iron framework. Tests have lately been made in Germany and Austria of the Monier arch in roof construction; and some of the results have been supplied to the *Engineering Record* by Mr. A. J. Marstrand. In tests made in Berlin under the supervision of the Government, an arch with a span of 26 ft. 3 in. and 2 in. thick was loaded unevenly with 5560 lbs., which was gradually increased up to 7825 lbs., at which the arch broke. The weight of the arch was 28·7 lbs. per square foot. A flat ceiling of the same thickness, 24 inches wide and 11 ft. 6 in. between the supports, was loaded uniformly with 11,100 lbs., which was increased to 22,252 lbs. before fracture occurred. In order to ascertain how much the iron netting assisted in supporting the load, two identical plates, each $1\frac{1}{16}$ inches thick and 3 ft. $3\frac{3}{8}$ in. between the supports, were made—one with, and the other without the iron netting. The plate without the netting broke at a load of 106 lbs. per square foot; while the other plate still carried a load of 566 lbs. per square foot—showing a deflection of ½ inch. Later, two other plates of the same thickness, and 4 ft. 11 in. between the supports, were tested. The one without the netting carried 135 lbs., and the other 1638 lbs. per square foot, or about 12 times as much, before breaking, and this load then remained supported by the iron netting. An isolated wall 11 ft. 6 in. long was loaded with 22,047 lbs. without showing the least sign of failure. A plate $3\frac{1}{2}$ inches thick, 3 ft. 9 in. between the supports, bore up a load of 18,079 lbs. on a surface of 9·9 square feet. It deflected 15-32nds of an inch, but was not injured in the slightest. A pipe of 6 ft. $6\frac{3}{4}$ in. in diameter and $3\frac{1}{16}$ inches thick stood a load of 2642 lbs. per square foot without showing any flaw. At 4342 lbs. per square foot the vertical diameter was shortened $2\frac{3}{8}$ inches, but the pipe was uninjured. In 1892, a railway bridge in Vienna, 32 ft. 10 in. span and $5\frac{7}{8}$ inches thick at the crown, was loaded with 220,470 lbs. upon a surface of 215·3 square feet, deflecting ½ inch at the top. After the load was removed, the arch recovered its shape. The loading was increased to 374,799 lbs., when the abutments showed signs of failure. At 432,562 lbs., or 2020 lbs. per square foot, the arch was distorted, without, however, being entirely destroyed.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1249.)

THE course of business on the Stock Exchange during the past week presents hardly anything calling for remark. One week is so much like another that it is difficult to find any distinguishing feature sometimes. If there be anything noteworthy about last week, it is that, owing to the counter attractions of Ascot, things were even quieter than they have been recently. Putting aside the gilt-edged descriptions, which go on steadily absorbing superabundant money, everything was dull and inclined to be flat. The flattest department was, of course, United States rails; but our home lines, after being depressed by the bad weather, cheered up with the returning sunshine, which promised improved traffic. There is the same glut of gold in the Money Market; and there is nothing visible ahead to alter it. The Gas Market has shown more activity, and continues to display persistent strength. Several issues have advanced more or less considerably, and none have receded. The Metropolitan undertakings have all done well. Gaslight "A" was marked at steady figures throughout the week; and, though the quotation was put down 1 at the start, it was put up 1½ at the finish. All secured issues were in good demand, and looked like improving their quotations, though the only one actually to advance was the "K" 6 per cent. South Metropolitans were moderately active; and "A" and "B" remained firm, while "C" rose 3. A small quantity of Commercial was taken at a nice advance; the stock being scarce. Very few transactions were effected in Suburbans and Provincials; and the only change was an advance in Bristol. The Continental Companies also were quieter; but European made a further advance. Among the more remote undertakings, changes were few; but movements were uniformly favourable. Sydney debentures rose 1; and the buying prices of Buenos Ayres, both shares and debentures, were advanced. Business in the Water Companies has been of the usual moderate proportions; and changes in quotations are few, though they are in the upward direction. A noticeable incident is that Kent has attained a quotation of 300.

The daily operations were: Business in Gas was pretty brisk on the opening day, especially in Gaslight issues of all sorts. The secured were very firm; but "A" was put down 1. Kent Water rose 2. Business was rather quieter on Tuesday; but prices were on the rise. Bristol gained 1; and Australian made a similar move. In Water, Lambeth tens rose 1. Wednesday was a still quieter day; but the general disposition to advance was accentuated. South Metropolitan "C" improved 2; and European ½. Business became more active again on Thursday; especially in stocks having a preferential position. Commercial old advanced 2. Further improvements were the feature of Friday. Gaslight "K" and Commercial old increased 2 each; South Metropolitan "C," 1; Buenos Ayres, ½; and ditto debenture, ½. Saturday was as quiet as usual; and the only change was a rise of 1½ in Gaslight "A."

GAS AND ELECTRIC LIGHTING IN MASSACHUSETTS.

THE routine history of the gas and electric industry of America affords but little opportunity for gathering statistics in regard to the lighting business—statistics, that is to say, which afford a comprehensive view of the operations of a large number of companies. Hence we turn eagerly to the annual report of the Gas Commissioners of Massachusetts, as giving us in concrete form the operations of each lighting company of the State, and a summary of the business of all the companies in the same territory. At the same time, statistics, like many other things in this world, must be up to date to be of value. Hence we note with regret the lateness of the appearance of the Commissioners' last report, which has been already mentioned in our editorial columns, and the figures contained in which are up to June 30, 1893. It will thus be seen that they are nearly a year old. This fact must be borne in mind when making deductions from the returns, because the "hard times," so called, had scarcely struck us a year ago; and if our review of the report shows a proper advance in the business, we must remember that the statistics do not cover the period of the industrial decline. When the returns for June 30, 1894, appear, it may be found that the revenue of the lighting companies—particularly those in manufacturing centres—has sadly fallen off in the past twelve months, as compared with previous years.

Turning now to the report, we find there are 134 concerns under the supervision of the Board. Of these, 24 supply gas and electricity, 62 only the electric light, and 48 only gas. The work of the Board, in making the computations for their report, is interfered with by the delay of certain companies in filing their returns. There were 30 delinquent companies last year, as compared with 45 in the previous year. The Board see no reason why all the returns should not be in before the time-limit fixed by law.

Brief mention is made of the action on the Bay State Gas Company's Charter of the legislation of last year, whereby the notes issued by that Company to the amount of $4,500,000 were cancelled; and the Company were allowed in lieu thereof to issue $1,500,000 of stock. A meeting of shareholders was held; and the capital increased to $2,000,000—the figure at which the Commissioners had valued the Bay State plant. They were called upon to investigate the price of gas at Springfield—one of the larger cities of the State; and in the report are given the history of the case and the decision. The Company in 1879 added to their regular business that of supplying steam for heating purposes; and it is stated as follows in regard to this undertaking: "For a long time afterwards, this branch of the business seems to have been unprofitable; and a considerable amount of the gas profits was used to maintain it. In the opinion of the Board, such a condition ought not to exist. The money invested in the steam plant should look for its profit to the steam business alone; and this principle has been followed in fixing the price." The Board directed particular attention to the matter of the capital stock of the Company; and they seem to take some exception to the capitalizing of the profits of the concern which had been put into the plant. "All profits of the Company, under ordinary conditions, as a matter of law, belong to the shareholders, and even when invested in plant may be divided among them if they see fit. But such a course is to-day generally recognized as against the best interests of a company, and contrary to the spirit of existing legislation in this Commonwealth. . . . When gas reaches the consumer, it is burdened with three obligations: First, its fair cost; second, a fair dividend on a reasonable amount of capital; and, third, such excess as will give the company sufficient surplus to enable it to meet extraordinary accidents, and conduct its business with the highest economy. The consumer is in duty bound to pay these charges. If he pays more, and the company converts this excess into new capital—increasing it to a figure beyond the fair amount demanded by the business—the consumer is burdened with too high a price for the gas in the first instance, and thereafter with a dividend charge upon his own contributions. A company which pursues this policy, and to this extent fails to appreciate its obligations to its customers, must sooner or later pay the penalty." The decision of the Board was that the price of gas should be reduced to $1·40 per 1000 feet.

The next case considered is that of the East Boston Gas Company, who came before the Board on a petition to reduce the price of gas. East Boston is an outlying portion of the City of Boston, given over chiefly to manufacturing industries. The Company supplying the territory is not one of the Addicks combinations. The main "bone of contention" in this case seems to have been the amount of the Company's surplus, which appears to have grown to a point that excited the animosity of the gas consumer. This surplus amounts to $80,000, or about 35 per cent. of the capital of the Company—half of it sunk in the plant of the concern, and the balance in interest-bearing investments. The report states: "In this consideration, it becomes an important and difficult question to determine the proper use to which these investments should be put, to discover what are the equitable interests of the stockholders and the public in them, and to determine how far, and in what way, the consumers may properly reap advantages from such accumulation. In view of all the relations existing between the two parties in interest, the Board is unable to agree that it should be treated as the exclusive property of either." The Board add that these profits would undoubtedly belong to the shareholders if the concern were to wind up, and that the Company have the legal right to divide them among the shareholders, but that such a course would be suicidal. They then say: "This surplus must, we believe, be regarded as the combined result of a wise corporate management and the contributions on the part of the public;" and they express the opinion that it should be used so that the public may obtain some substantial advantage therefrom, and that an examination of the works makes it appear that there is a demand for the investment of a portion of this surplus in them. The Board recommended that the price of gas should be reduced to $1·50 per 1000 cubic feet.

The report next deals with the cases of Boston, Roxbury, South Boston, and Dorchester; and as the Companies supplying these districts are, while separate corporations in the eye of the law, under one management, the cases are treated under one head. The Boston case proper is first considered; and, briefly, the report states that the Board felt that $1 per 1000 cubic feet was a fair price, and fixed the rate accordingly. In response to the request to make the same rate apply to the other Companies, the Board decided that the request was unfair, chiefly by reason of the smaller sales per mile of main. The report states that many advantages accrue to these Companies from their intimate joint relations, and that the public have shared in a portion of these benefits, but that the consumer has not received all the concessions to which he was entitled on this account. The Board therefore fixed the price in Roxbury district at $1·20; and in the Dorchester and South Boston territories, at $1·30 per 1000 cubic feet.

The report alludes at some length to the appeal of the Boston Gas Company against the permit of the City of Boston giving the Brookline Company the right to lay gas-pipes under the streets. By virtue of the Act creating the Gas Commissioners, an established gas company can appeal to the Board

against a decision of the Mayor and Aldermen of a city which gives a new company the right to lay gas-pipes in the city. But the Brookline Company had, prior to the passing of this Act, supplied gas in an extreme suburb of Boston; and it was therefore contended that the Company did not come under the action of the statute in question. As the Attorney-General of the State gave the Commissioners an opinion to this effect, the Board dismissed the appeal.

The report next deals at great length with the appeal of the Worcester Electric Light Company against the action of the Mayor and Aldermen of that city, conferring upon a would-be opposition electric light company the right to put up poles and run wires so as to compete with them in the business. The Board discusses the question raised by the new Company—viz., that competition would result in benefit to the consumers. But as no argument was advanced in support of this contention, the Board felt that, where combination is possible, competition could not, in the long run, be of advantage to anyone; and so they sustained the appeal, and annulled the action of the Mayor and Aldermen.

The Commissioners proceed to consider the application of the citizens of Brookline for a reduction in the price of gas to $1 per 1000 cubic feet. Briefly, the Brookline Gas Company are supplying gas in Boston at the dollar rate, but charging 50 c. additional in Brookline. This discrimination naturally led to hard feeling; and hence the petition. But the Board decided that, because the Company supplied gas at the lower rate, it did not follow that they could afford to do so; and, further, that an examination of the works of the Company showed that this was less than the cost of gas, without any allowance for interest or dividend. The Board intimated that the cost of management and of leakage was high, but that of the actual manufacture reasonable; and their finding was that the price should be fixed at $1·40—a reduction of 10c.

In the decision in the Chelsea case, which, like many of the others considered, was on a petition for a reduction in the price of gas, we note that the Board decided that in years past the Company had very largely increased their capital account, and therefore must now bear the burden of their former misdeeds by accepting slightly reduced dividends; and on this basis they reduced the price of gas to $1·65 per 1000 cubic feet. This was the minimum price the Company could charge; hence the system of allowing a discount for prompt payment had to be abrogated. The Company therefore applied later on for a reopening of the case. They contended that as the Board had reduced the price in 1891 to $1·80, it was unjust to have made this further drop. The Board agreed to reopen the case; and they finally fixed the price at $1·70 if paid on or before the 25th of the month in which the bill is presented.

We shall, in subsequent articles, deal further with the other contents of the report.

FETTERING THE LONDON WATER COMPANIES.

NOTHING but bewilderment seems to dog the efforts of those who are seeking to develop a system of sinking funds which shall effectually cheapen the undertakings of the London Water Companies when (if ever) the day comes for buying them up. Nor is this state of doubt and difficulty to be wondered at; for what is the plain fact? Certain public bodies are seeking to hamper the Companies with unnatural conditions, wholly foreign to, and inconsistent with, the original charter entrusted to them by the Legislature. The Companies, it seems, are only to be allowed to live and draw in the sustenance of additional capital on the understanding that they live in irons. How to forge the fetters in the most effective form is a task to which certain public bodies appearing before the House of Commons Committee presided over by Sir Joseph Pease have been diligently addressing themselves for some time past.

The net results were duly reported in last week's JOURNAL in relation to the proceedings on the several Bills of the East London, West Middlesex, and Southwark and Vauxhall Water Companies. It will be remembered that on the 2nd of May Mr. Pember, Q.C., brought up a sinking-fund clause (which will be found set forth on p. 918 of the JOURNAL for May 15); and, on that occasion, after hearing the evidence of the City Remembrancer and a statement as to the manner in which the sinking fund had been dealt with since 1888, the Chairman of the Committee made some observations for the guidance of the contending parties. The Committee considered that the sinking fund clauses as then proposed were unnecessarily complex in drafting and operation; and they gave the promoters and opponents of the Bills an opportunity for producing clauses of a simpler character. No doubt this hint has been fruitful of much legal ingenuity and effort; but, judging from what took place before the Committee on the 4th inst., it cannot be said that the outcome of these labours is likely to give satisfaction all round. The amended clause submitted to the Local Government Board met with emphatic disapproval at the hands of that Board, and brought to light the fact that widely divergent views exist as to the very object with which the sinking funds were first created. Then, too, the Committee were confronted with evidence which went to show that the capital now proposed to be raised will produce no profit at all, but, on the contrary, will actually tend to a reduction of dividends. While, as to the West Middlesex Company in particular, it was pointed out that, inasmuch as the full statutory dividend is maintained, the benefit of future profit belonged to the consumers; so that every shilling taken for the sinking fund would be to the direct injury of the public, for whose benefit, theoretically, the fund has been called into existence. A curious outcome, this—that the eager guardians of public interests should actually be on the point of being "hoist with their own petard." How to avoid that dire result the Committee have diligently endeavoured to discover. Of course, the whole question is whether or not the Companies shall be allowed to raise capital under such conditions that an enhanced price will inevitably have to be paid when the works are taken over by a public authority. Thus we witness a desperate and, in some respects, ludicrous attempt to stem the tide and maintain the *status quo ante*, when, in fact, the *status* is being materially altered. The result of the further deliberations of the Committee on what their Chairman describes as "this difficult and intricate question," upon some features of which "high legal opinions are at variance," is as follows: They take the clause in the Act of 1891 as the standard for the capital raised under the three Acts of 1886, 1891, and 1894, without in any way interfering with the payments already made to the City Chamberlain. This continues the allowance of 1 per cent. to new capital, and practically provides for a fund to meet contingencies, which, however, is not to form part of any calculations of value if the works are sold to a public authority.

As to the position of the Chamberlain, the Committee expressed disapproval of certain proposals submitted by the Essex County Council, and to some extent condemned the scheme suggested by the Corporation of London. The Committee hold that the Chamberlain is a trustee for Parliament; that he ought not to have indiscriminate powers to buy stock, nor to vote or take part in the management in respect of the shares vested in him for a special purpose; and, moreover, "that it would be against public interest that he should even remain for many years in the position now assigned to him." In these observations lurks a practical condemnation of the device of which the City Chamberlain is the figure-head. The Committee see very plainly that, in the long run, the idea will not work; and they wisely refuse to establish the Corporation functionary in his position as watch-dog, with any greater length of chain than the Legislature has already attached to him.

Electrolysis of Water-Pipes.—The electrolysis of water-pipes has now become a very serious matter in San Francisco. A 30-inch pipe belonging to the Spring Valley Water Company has lately been repaired so often that a number of measurements have been made of the electrical conditions about it. It is stated that at one point the difference in potential between the pipe and the neighbouring rails of an electric road was 16 volts, and that the current amounted to 116 ampères.

A Large Gas-Engine.—We learn from a contemporary that Messrs. R. MacLaren and Co., of Port Eglinton, Glasgow, have instructed Tangyes Limited to fix for them a 60 nominal horse power single-cylinder gas-engine, with producer gas plant for working it. The engine is to replace about a dozen steam-engines; and it will have a regular working load of 100 brake horse power. It is expected to develop 1 indicated horse power with a consumption of only 0 8 lb. of anthracite coal per hour, which will probably be about 1·2 lbs. per brake horse power. The coal measures of the West of Scotland contain a large quantity of anthracite coal suitable for the generation of gas for working this type of engine; but up to the present time, the demand in the district has been small in proportion to the possibilities of supply. The adoption in Scotland of such engines would provide a market close at hand for this mineral.

Impact Tests of Cast-Iron Pipes under Hydrostatic Pressure.—In a recent number of *The Foundry*, Mr. S. Groves described some experiments conducted by him, to determine the effect of impact tests applied to pipes under hydrostatic pressure, while he was engaged in a large English pipe-foundry. Two socket and spigot pipes, 4 inches in diameter by 9 feet long and $\frac{3}{8}$ inch thick—one cast vertically, the other at an angle—were subjected in the hydraulic proving-press to a hydrostatic pressure of 260 lbs. per square inch; and while under this condition, a wrought-iron ball, weighing 1$\frac{1}{2}$ lbs., was caused to fall upon a chalk-line mark on the body of the pipe, at given points and from varying heights. The pipes were then taken out of the press, and broken longitudinally into two parts. On the inside of each pipe, at the points where the ball had struck dead upon the centre line, was a star-shaped fracture. The fractured half of each pipe was then broken into two parts, and each piece upon which a blow had been struck was carefully broken through the star-shaped fracture. In each section was an oxidized fracture penetrating through the inside skin of the pipe into the body metal; and in no case was the depth less than 3-32nds of an inch—the greatest being 5-32nds. Where the ball did not fall dead upon the centre line, the fractures were only slight; but in every case where it struck true, a serious fracture occurred. Mr. Groves therefore came to the conclusion that, instead of the hammer-sounding test being a safeguard, it is actually a danger; being worse than a variation in body thickness of $\frac{1}{16}$ inch, for which many a pipe has been rejected as unsafe.

NOTES.

Cement Renderings.

In an article upon cement and cement-testing which appears in the current number of the *Engineering Magazine*, Mr. S. B. Newberry offers some observations upon the use of cement as an internal rendering to make tanks and reservoirs waterproof. He remarks that the impermeability of cement mortar increases greatly with age; so that comparatively porous mixtures will become quite dense in time. For linings required to be immediately waterproof, not more than one and one, by weight, of sand and cement can be safely used. A mixture of one of cement to two of sand will, however, prove impermeable after the lapse of a few weeks. The addition of slaked lime to the mortar greatly increases its density, and also the strength of mortars poor in cement. For concrete, a mixture of one part of lime, previously well slaked, one part of Portland cement, and six parts of sand, will be found to give as good results as if the mixture had been two of cement to six of sand; the lime thus replacing half the cement, without causing loss of strength. For waterproof renderings, a mixture of one part of cement, one-half part of slaked lime, and three parts of sand, or even of one part cement, one part lime, and six of sand, will be found sufficiently impermeable. It has also been found that the addition of slaked lime to cement mortar greatly increases its adhesion to brick or stone. Masons often object to using mixtures of cement with three or more parts of sand as mortar for brickwork and masonry, on account of its working short under the trowel. Increasing the proportion of cement is extravagant and unnecessary. The objection can be overcome by adding one part of slaked lime, which will make the mortar fat, plastic, and easy to work.

The Bactericidal Effect of Sunlight.

An addition has been made to the available stock of information respecting the means of self-purification of rivers by Dr. Procacci, who has conducted a prolonged investigation on the bactericidal action of sunshine upon the microbes normally present in rain water. In these experiments, cylindrical glass vessels, about 60 centimetres high and 25 centimetres wide, were employed; some being freely exposed to sunshine, while others were kept in darkness. The temperature of the water was, as nearly as possible, the same for both sets; and in neither case did it ever rise beyond 42° C. In every instance, a marked diminution in the contained bacteria was observed in the vessels that had been sunned; while at the same time a more or less marked increase took place in those kept in the dark. The period of exposure varied from 1½ to 9 hours. The investigation was also directed to ascertain to what depth of water the bactericidal power of sunshine extends; and it was found that this was unimpaired at a depth of half a metre. In summarizing his results, Dr. Procacci states his belief that the bacterial purification which occurs during a river's course may, in some cases, be attributed directly to the destructive action of sunlight upon the suspended microbes, especially when the rate of flow is presumably too great to permit of sedimentation taking place.

The States of Matter.

The connection between the different states of matter has been a great attraction for students of physics for a considerable time; and some light has been shed by a number of experiments upon the phenomena which attend the transition from the fluid to the gaseous state. One of the most important generalizations which has been obtained in recent years from the study of the effect of temperature and pressure on the volume of stable liquids and gases is expressed by Mr. J. W. Rodger, in *Nature*, as the law that, if the volume of a given mass of substance is kept constant, increase of pressure is proportional to increase of temperature. This relationship was proposed as early as 1878 by Lévy, who was, indeed, anticipated to some extent by Dupré in 1869; but it was first set upon a firm experimental basis, at least for vapours, by Ramsay and Young in 1887. Mr. Carl Barus has carried experiments upon the effect of pressure on liquid substances farther than anybody else; having been enabled, by the United States Geological Survey, to work with pressure up to 3000 atmospheres. Among other substances, Mr. Barus has studied the volume charges produced by the pressure during the solidification and fusion of naphthalene at various constant temperatures. The remarkable result thus arrived at is that, during change of state, the "on" curve obtained by increasing the pressure and passing from liquid to solid is quite distinct from the "off" curve obtained on passing from solid to liquid. At any temperature, solidification always occurred at a higher pressure than that at which the solid fused. This is in harmony with the well-known fact that the temperature of the ordinary melting-point of a substance is in general higher than its temperature of solidification. The main importance attaching to this work on naphthalene lies in the fact that it constitutes the beginning of a systematic study of the phenomena of solidification, which, in conjunction with what is known regarding liquefaction, will ultimately permit of the entire transition from gas to liquid, and from liquid to solid, being represented on a single diagram. When this has been accomplished, material will be to hand for framing a comprehensive theory of what goes on through the obscure processes of change of state.

The Manufacture of Carbon Black from Gas-Flames.

According to a communication by Mr. Godfrey L. Cabot, of Boston, to the Scottish Section of the Society of Chemical Industry, there is in existence in the United States a small industry which consists in the manufacture of lampblack from natural gas. The gas is burnt for this purpose in ordinary lighting-burners, and is caused to impinge upon the surface of cast-iron plates or rollers, from which the black is scraped automatically. The industry had its origin in the discovery, by certain makers of printing-ink in Philadelphia and New York, that the soot recoverable from artificial illuminating gas gave a beautiful gloss and intense colour to printers' ink; differing totally in these respects from the lampblack obtained in the ordinary way by burning oily or resinous matter in an insufficient supply of air, and allowing the smoke to settle in deposition chambers. This led to the use of natural gas, which was cheaper than the artificial product, for the same purpose. One difference between gas soot and lampblack is stated to consist in the fact that, whereas the former will mix with water by merely shaking together, the latter, generally speaking, will not. At present the gas black is made by causing the flame of many hundreds of gas-burners to impinge upon a circular cast-iron plate 24 feet in diameter, which revolves horizontally over the flames, and is scraped by knife-edges which cause the deposited soot to drop into a trough, whence it is removed by an automatic conveyor. The material sells for 7c. a pound at the factories; and the production is about 3,000,000 lbs. per annum. The chemical composition of the American gas black is: Carbon, 92 to 93 per cent.; oxygen, 5 to 6 per cent.; hydrogen, 1 to 2 per cent.; and no trace of any mineral matter. Mr. R. Irvine says, with respect to Mr. Cabot's statement, that English printers' ink manufacturers made the same quality of black thirty years ago from ordinary town gas; but, seeing that not more than 1 lb. of the product was ever made from 1000 cubic feet of gas, the manufacture did not pay.

TECHNICAL RECORD.

GAS TRACTION FOR TRAMCARS.

In the JOURNAL for Jan. 23 last (p. 152), we gave some particulars, translated from the *Journal für Gasbeleuchtung*, of the systems introduced by Herr Kemper, of Dessau, and Herr Lührig, of Dresden, for driving tramcars by gas-engines. The satisfactory working of the last-named gentleman's system has led to its importation into England; and, under the auspices of the Traction Syndicate, Limited, who have acquired the patent rights, and with the cordial co-operation of the Croydon and Thornton Heath Tramways Company, it has been put into practical use on that Company's line. Experimental runs have been going on for some time; and, in order to interfere as little as possible with the ordinary traffic, they were made at night. The arrangements were recently completed to the entire satisfaction of the Board of Trade Inspector; and the running of gas-driven cars for the regular service was to commence last week. Before starting, however, a trial trip was made on Tuesday afternoon, in the presence of Mr. R. W. Wallace, one of the Directors of the Syndicate; Mr. Percy Holyoake, the Secretary; Mr. H. P. Holt, of Messrs. Crossley Bros., Limited; Mr. W. J. Carruthers Wain, the President of the Tramways Institute; and several gentlemen representing the tramway interest and the Press.

The car to be used for the new service is lighter in appearance than an ordinary horse car; and it is also rather smaller—being only 11 feet long inside, with about 3 feet of platform at each end. It will, however, seat sixteen passengers inside, and twelve outside. The body of the car stands high from the ground, to afford space for the machinery. This consists of an "Otto" gas-engine specially suited for tramway duty, and capable of working up to a speed of eight miles an hour—the maximum allowed by the Board of Trade. The speed can be regulated and the car guided from either end. The engine, which is located beneath the seat on one side, is fed from three cylinders—one being on the opposite side of the car, and the other two placed transversely under the floor. These contain a store of gas sufficient for a run of eight miles; and they can be re-charged in about two minutes. The gas is compressed to eight atmospheres; and it passes into the engine cylinders through a reducing-valve. The ignition of the charge is effected by electricity; and the exhaust gases pass into a condenser. The whole of the driving plant is concealed from view by screens reaching almost to the rails; and the cars are furnished at either end with extending guards, similar in form to those with which American locomotives are provided. The cylinders beneath the car are filled at the charging-station, which is situated at the Company's depôt at Thornton Heath. The plant here consists of an 8-horse power gas-engine, a compressor, and a steel storeage cylinder, 25 feet long and 4 feet in diameter. Into this vessel the gas, drawn direct from the main, is compressed to ten atmospheres. This plant will suffice for the five cars with which the regular service will start; but it can easily be extended, on the same area, to meet the demands of twice this number, without any increase

of motive power. From the receiver the gas cylinders on the car are charged by means of an ordinary india-rubber tube, in the same way as the railway carriage cylinders are filled with Pintsch gas.

The run was made from the depôt up to Thornton Heath Station, and continued for a short distance over the railway bridge. The line is of the ordinary character up to the bridge, where it rises on a gradient of 1 in 18, drops on the other side at 1 in 27, and then makes a sharp curve. From this point the car returned to the depôt, and then ran the length of road terminating at the Greyhound at Croydon, where luncheon was served, under the presidency of Mr. Wallace. As an exemplification of the adaptability of gas power for tramcar traction, the trial was perfectly successful; the only matters which led to critical remarks by some of the visitors being the vibration inseparable from running machinery, and the slight "gas-engine" odour occasionally perceptible. There was nothing, however, likely to give rise to discomfort to the passengers.

It only now remains to refer to the question of cost. It may be stated broadly that the initial outlay is practically the same as for the old horse-drawn cars. With regard to working expenses, we have it on the authority of the President of the Tramways Institute that all existing modes of traction are too dear; and consequently the bulk of the large amount of money invested in tramways—something like £14,000,000—is unproductive. Attempts to remedy this state of things have been made from time to time; the latest being at Thornton Heath. The promoters of the enterprise state that they can carry 40 passengers at the cost of 1d. per mile for gas, reckoned at 3s. per 1000 cubic feet. If the latter figure could be lowered one-third, and a gas of greater heating power supplied, so much the better. With the existing figure, however, we may leave the advocates of other systems of traction to show that they can do better than their new competitor.

WESTERN (U.S.A.) GAS ASSOCIATION.

The Seventeenth Annual Meeting of this Association was opened at Cleveland on the 16th ult., under the presidency of Mr. E. H. Jenkins, of Columbus.

After a welcome from the Mayor of the city, the President delivered an Inaugural Address. He alluded to the fact that they were meeting at the birthplace of the arc electric street lamp in the United States, which was first introduced by the Brush Electric Lighting Company of Cleveland at Wabash, Ind. He proceeded to review the subsequent history both of gas and electricity, referring to the prophecies as to the utter extinction of gas that followed the introduction of electricity, and the actual results in practice. The arc light was assisted by every possible encouragement; but the public were now beginning to look at its cost. There was every indication that the sentiment with which it was received was dying away, and that electricity and gas would be each "weighed in the balance," and must each stand on its own merits as to cost, convenience, and service rendered. It could hardly be doubted that gas, at a reasonable price, was cheaper than electricity, especially for private lighting. Gas-burners did not deteriorate like electric incandescent lamps. With regard to the last twelve months, the gas industry had not escaped the widespread unsettled condition of affairs that had prevailed; but no other business had been so well able to meet its obligations and maintain its earning capacity. Touching upon the subject of municipal ownership, which was a prominent topic in many of the leading magazines, he thought the gist of the whole matter was a demand for lower-priced gas, and a hope that the municipalities could sell it cheaper than the companies did at present. This question would come to every company sooner or later; for it was easy to argue that the dividends paid to the stockholders could be saved, while the fact that companies can in many ways work cheaper than municipalities was not so obvious. He was a firm believer in gas at the lowest price consistent with fair dividends. To accomplish this, it was necessary that the whole of the plant should be in every way up to the requirements of the time. Seeing that it was desirable to look into this question, he suggested the appointment of a Commission to gather details of the cost of manufacturing and distributing gas in the different cities, having regard to scale of operations, cost of material and labour, and all other matters likely to influence the result. This information should be corrected from year to year, and should be for the exclusive use of the members of the Association. Then, when going into questions of contract, or when threatened with opposition or the proposition of municipal control, reliable references would be at hand, which at present could only be secured at considerable expense and loss of time. Turning to the introduction of gas-stoves, the President remarked that these appliances would not sell themselves; and he said that the success attending such efforts was usually proportioned to the energy employed. In addition to gas-stoves, there were many ways in which gas could be applied as a fuel; and no branch of the gas industry gave better returns. Excellent results had been obtained during the past three years with a combined gas and steam heating apparatus. The President then proceeded to refer to an exhibition of gas appliances which was being held in connection with the meeting. Messrs. Connelly had introduced a new use for gas—that of motors for street cars. Their apparatus was first intended for Pintsch gas; but it was now found that ordinary gas would do, about 2000 cubic feet per day being required for each car. The first cost was only about half that of an electric system; and the working expenses were less than with horses or with electricity. There was also the great advantage that each car was perfectly independent of the remainder. According to an electrical magazine, electric storeage batteries were not a success as applied for motive power. A Committee appointed at the 1892 meeting to revise the rules had made a report last year, which was adopted; but, according to the rules, it would come before the present meeting for final action. In concluding, the President referred to the step taken by the American Gaslight Association in the matter of Federation, as suggested by Mr. W. R. Addicks; and he announced that a report from the Special Committee appointed by their own Association to consider the subject would be forthcoming.

The report of the Board of Directors was adopted; and this included the acceptance of the alterations in the rules, as suggested last year, by the present meeting.

An animated discussion was held on the use of electrical apparatus for lighting gas. Mr. Russell thought it would not do for street lighting; but he knew that it was in successful operation in private houses. Several makers of electrical apparatus were taking up the matter; and it could be fitted very cheaply. If properly fixed in the first place, and the wires and batteries were looked after, it paid to use electricity in this way. Mr. Highlands kept a corps of electric-wire men, and devoted some attention to this matter. His customers were pleased, as they could turn on the gas as easily as electricity. He had fitted up some 30 houses; and none of the occupants cared to use electricity rather than gas. Mr. M'Ilhenny had the system in his house, and spoke highly of the convenience and comfort of being able to light up any of his rooms by simply touching a button. He would not be without it on any account, as it was also a great safeguard. The only working cost was that of renewing the batteries, which could be done for a few shillings a year. Mr. Penn used a similar arrangement; but he charged it with a storeage battery, which was replenished as required from his own electric light plant. Mr. M'Ilhenny, in reply to questions, said he did not understand the details of the apparatus; but the same key turned the gas either on or off, by simply pressing a button. There was a white and a black end—one for lighting and the other for extinguishing. Mr. Highland said that the apparatus was also successfully applied for lighting outside front lamps, perhaps some distance from the house, from within. The first cost of a complete apparatus for 100 gas-burners was £25. Separate wires were required for each burner employed, or for a set or group of burners used together.

Mr. G. T. Thompson, Chairman of the Committee appointed to inquire into the question of electrolysis, presented a very full and long report, commencing with a clear description of the decomposition of metallic salts by the action of electricity, the deposition of metals, and their transference from the positive to the negative pole of the battery. The decomposition of iron or lead pipes by the action of electricity was then explained it being shown that no harm would be done where the current entered the pipe, nor would it in every case be likely to follow by the passage of electricity along the main. The injurious action occurred at the point where the current left the pipe. Where electric tramway apparatus supplied the current, this effect would be likely to obtain in the vicinity of the power station, or at points when the pipes crossed beneath the tracks. The electricity would always follow the path of least resistance. At the point where the electricity left the pipe, the latter became the positive pole; the earth acted as the electrolyte, or chemical solution (and in this it was greatly assisted by the presence of water, salt, ammonia, or other chemicals); and the rail or other objective point was the negative. Under favourable circumstances, the destruction of the pipe at once commenced; and the rapidity with which the injury proceeded depended on the quantity rather than the voltage of the current. In some cases, new service-pipes had been destroyed in a month. Some persons took no interest in this matter, because they had not as yet suffered; but the Committee desired to point out that, in any city where an electric road was operated on the plan of any part of the return through the ground, the gas and water pipes were not safe. More complaints came from water than from gas companies, because the pipes were larger, had no cement joints, and were under higher pressure; and the flowing water also perhaps added to the conductivity. But complaints about gas-pipes were increasing in frequency, and would continue to do so. Coming to the question of remedies, coating the pipes with non-conducting paint, or casing in earthenware drain-pipes, had been tried. The latter had been used for the protection of services crossing under the rails. Such a covering would be a protection if the pipe were free from electricity; but if it had already been charged at another part, it would simply transfer the point of corrosion, by causing the current to seek another exit. It could therefore be easily determined, by testing, whether the insulation would be effective. Laying pipes in conduits packed with sawdust or with pitch were other ways of applying the same principle. Attaching earth plates and copper to the pipes had been tried; but it was abandoned, because the plates

were rapidly destroyed. In one case, the crossing of services under the tracks had been avoided by laying mains each side of the streets; but the existence of parallel lines of rails and pipes, both uninsulated, would probably be attended with electric leakage or induction. A Committee dealing with the subject in England had recommended 6 feet of dry earth as a reliable protection; but it was difficult to see how such a remedy was practicable. Cement joints were helpful, as increasing the resistance; but, if subjected to strong currents, they might become a source of danger. It had been found that the danger was not so great when the overhead wire was the positive and the rails the negative; and as the cars would work equally well in either direction, this plan had been generally adopted by the electric companies. Better contact had also been attempted by joining the rails with copper wires: but so far nothing like an adequate section of copper had been used. A 60-lb. rail required a copper wire of $1\frac{1}{8}$ inches diameter to represent equal resistance. Welded joints had been introduced, with the object of reducing the jolting of the cars at the joins; and continuous tracks three or four miles long were already in use. An incidental advantage of these was a better return of the current. Long lengths of rail, up to 100 feet in each, had also been tried; and these were a step in the right direction. The use of the three-wire system had also been adopted, and with reported success. Masses of old iron had been buried at certain points, to act as collectors of earth currents, and connected to the stations with wires; but this plan was not of much use. Attempts had also been made to employ the whole system of underground mains in this way—connecting them with the negative terminals at the power-house at intervals—and they had further been intentionally used as conductors, by connecting them to the rails in addition. These arrangements were not desirable; and a gas company should also object to the water-pipes only being used for this purpose. The Committee considered that, while these remedies were palliative, not one of them met the requirements of complete protection, nor could they do so in any system when the rails were used as conductors. Where there were long lengths of parallel rails and pipes, some of the current must find its way to the latter, as long as the rails offered any resistance at all. They had not considered the question of alternating current motors, because although these had been proposed, they were not on the market. Many large roads were now trying an insulated conductor for the return current, connected to the rails at intervals of 400 or 500 feet. This certainly seemed likely to reduce liability to leakage; but as the rails themselves could not be insulated, absolute and complete protection could only be obtained by avoiding the use of the rails as conductors. Double wires, either overhead or in conduits underground, met this condition. The first was the original way of working; and invention was rife with regard to the second. As it offered an economy of from 10 to 25 per cent. of current, and trolley wires would in time fall victims to the clamour for putting wires underground, the extension of the conduit system seemed probable. The attention of the Committee had also been directed to the effect of short interruptions or breaks in a pipe-line when used, intentionally or otherwise, as a conductor—such as ignition of yarn in the sockets of pipes, &c.; but as the solution of the electrolytic question carried with it the remedy for these effects, they need not be further considered. It was evident, however, that the gas or water companies could not protect themselves; and therefore the onus of providing an absolute remedy or indemnification from the effects should be laid upon the electrical companies. The question of whether they had any right to use pipes belonging to other parties as conductors had not been tried in law; but a telephone company had been successful in showing that it was not a legal duty to protect themselves, and that it devolved on the other party to refrain from causing injury. Water companies were also notifying that the electric companies would be held responsible for damage; and gas companies could not do better than co-operate for mutual protection. If necessary, the aid of the Law Courts to get a restraining injunction should be resorted to. Pipes should be protected at exposed points—drain-pipe casing being best for small, and wood casing with pitch for large pipes; and the policy of increasing the resistance by insulation should be followed, rather than that of increasing conductivity by wiring. (An appendix to the report comprises a formidable list of works of reference that had been consulted; and a number of specimens of corroded pipes were exhibited.)

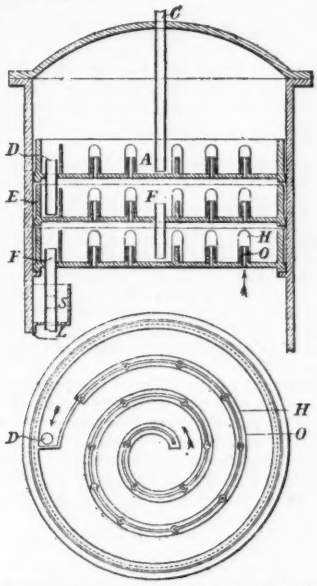
A conversational discussion followed the reading of the report. It was resolved, on the motion of Mr. Butterworth, that whereas it had been shown that the use of earth returns necessarily caused a gradual but sure destruction of street mains and services, which could not be guarded against by the owners, the electricity companies should be called upon either to promptly adopt such measures as would ensure immunity from such action, or take the whole responsibility of the same; and that the gas companies represented on the Association should combine with other interests concerned to secure prompt attention to this matter. Mr. Harbison directed the attention of the members to the danger that might arise from the occurence of fire or of personal injury to workmen engaged to repair pipes damaged by electrolysis, or in which an electric current might be present.

(To be continued.)

REGISTER OF PATENTS.

Distillation of Ammoniacal Liquor.—Pettigrew, G., of Middlesbrough. No. 10,171; May 23, 1893.

This invention refers to the distillation of ammoniacal liquor, for the manufacture of sulphate of ammonia, in a round still made of cast iron or other suitable material.



In the upper part are a number of shallow helical trays; and the liquor flows in, by the pipe C, to the centre of the first tray A. It then flows round each circumvolution into which the tray may be divided (in the direction shown by the arrow), from the centre to the overflow-pipe D at the circumference. The liquor flows down this pipe to the circumference of the second tray E; and its direction is here reversed—the liquor flowing round each circumvolution from the circumference to the pipe F in the centre of the tray, and passing down this overflow to the centre of the third tray. The liquor now flows from the centre to the circumference, as in the first tray; and so on to any number of trays. The liquor, having passed through all the trays, flows down the overflow-pipe F, the end of which dips in liquor contained in the sealing-box S. The bottom part of the still is divided into two compartments; the liquor overflowing from the box S, down the pipe L, to nearly the bottom of the first compartment, where it is mixed with milk of lime. The liquor rises in this compartment to nearly the top of the division-plate; and it then flows through a pipe which conveys it to nearly the bottom of the second compartment, where it rises to the height of the overflow from the still.

The steam to heat the liquor is let into the still at the bottom, in the usual manner, and with the heated gases passes up through holes in the trays, in the direction of the arrows, into hoods H, made to cover each circumvolution of the trays; the bottom edges of the hoods resting on the inside bottom of the trays. The bottom edges of the hoods are serrated to a depth less than the height of the top of the overflow-pipes from the inside bottom of the trays—thus ensuring that the serrations in the bottom edges of the hoods are always covered with liquor when the still is in action. The steam and heated gases depress the liquor under the hoods, passing out through the serrations in the bottom edges of the hoods; up through the liquor flowing between each circumvolution of the trays; and out at the top of the still to the saturator.

Atmospheric Gas-Stoves.—Batty, T., of Colchester. No. 20,010; Oct. 24, 1893.

The patentee states that his object is "to provide a convenient and effective apparatus for warming rooms with radiant heat, from a small supply of gas, by obtaining perfect combustion and great additional heat by means of a regenerative expansion chamber, where the gas and air are detained before ignition, and expanded by the dilatation of heat." The mixing-chamber has a tube in the centre tapering from 2 inches to ½ inch. Up this tube the gas from an ordinary burner passes into the upper part of the chamber; taking with it, at full pressure, about seven times its volume of air. The bottom half of the chamber is slotted radially from the base; and as the gas forces its way upwards, it is driven through the slots, where it is ignited and consumed on the outside of the chamber. The burners are so placed that all the heat is directed "to play upon the mixing-chamber, in which the gas and air are detained and expanded to two or three times their volume;" and by this means it is claimed that "they are most perfectly mixed, and a large addition is made to the radiant heat given off from the surface of the stove, while the escape of unburnt gas and poisonous fumes is prevented."

Determining the Density of Gases.—Frère, G., and Meslans, M., of Paris. No. 70; Jan. 1, 1894.

The present application, it is stated, has for its object "to guarantee to us the ownership of novel methods and apparatus which we have designed for the determination of the density of gases and the applications resulting therefrom."

The patentees say: It is known that, according to the principle of Archimedes, any body submerged in a fluid loses a part of its weight equal to the weight of the fluid which it displaces. If, therefore, a

balloon of volume V be plunged into a gas, the loss of weight p which it undergoes will be $= 1{\cdot}2932$, being the weight of a litre of air at 760 mm. pressure and 0·625 or $\frac{5}{8}$ the relative density of aqueous vapour, t the temperature, a the coefficient of expansion of the gas at constant pressure $= 0{\cdot}00367$ for air, H the atmospheric pressure, F the maximum tension of aqueous vapour at t degrees temperature, E the degree of humidity—that is, the relative tension of the aqueous vapour. Thus E F is the tension of the aqueous vapour, and D the density of the gas in question—

$$p = V\frac{1{\cdot}2932}{1+at} \times \frac{H - \frac{5}{8}EF}{760} \times D.$$

If the balloon is afterwards plunged into pure air, the result will be

$$p^1 = V \times \frac{1{\cdot}2932}{1+at} \times \frac{H - \frac{5}{8}EF}{760}$$

If we subtract these two equations, we get—

$$p - p^1 = V \frac{1{\cdot}2932}{1+at} \times \frac{H - \frac{5}{8}EF}{763} (D - 1), \text{ from which}$$

$$D = 1 + \left(\frac{p - p^1}{V} \times \frac{1+at}{1{\cdot}2932} \times \frac{760}{H - \frac{5}{8}EF}\right).$$

This method presents great difficulties in its application. It is necessary, in effect, to operate with the gas and with air at the same temperature at the same pressure, and with gases perfectly dry or presenting the same hygrometrical degree. To obviate these disadvantages, we have conceived the idea of effecting these two operations simultaneously, by means not of the same single balloon, but of two balloons of exactly the same volume, which we submerge, one in air and one in the gas to be tested.

For this purpose, each of the balloons is suspended at the extremity of a single balance-arm above a receptacle; the two receptacles being placed in a vat full of cold water, to insure an equality of temperature. In one of the receptacles is air; and in the other, the gas to be tested. The two gases are in contact with the water contained in their receptacles; and they are therefore in the same hygrometrical condition. If the two receptacles contain air, the arm will rest in equilibrium; and the needle will point to 0 on the scale. If in one of the receptacles the air is replaced by gas of different density, the equilibrium will be destroyed; and the difference in weight will be found either by adding a known weight or by displacing a rider on a graduated scale on the arm, or by reading the deflection of the needle on the scale. If the preceding formulæ be applied to each case, one obtains—

$$D = 1 + (p - p^1)\left(\frac{(1 + 0{\cdot}00367\,t) \times 760}{1{\cdot}293\,V\,(H - \frac{5}{8}EF)}\right)$$

or by designating by P the difference $(p - p^1)$ and by K the quantity $\frac{760}{1{\cdot}293\,V}$

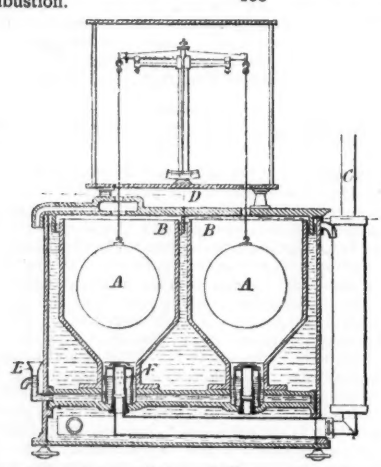
$$D = 1 + PK\frac{1 + 0{\cdot}00367\,t}{H - \frac{5}{8}EF}.$$

It is therefore sufficient to mark on each balance the constant K, and to then determine the difference P.

If we consider particularly carbonic acid gas (produced in the combustion of furnaces, for example), the volume has been produced by a volume of oxygen equal to itself. If the combustion takes place in air, the products of combustion contain 1 volume of carbonic acid and 4 volumes of nitrogen. If it is desired to ascertain whether combustion takes place under the normal conditions just pointed out, the density of the mixture ($1\,CO_2 + 4\,N$) must be considered, and not that of carbonic acid alone. This density is

$$\frac{4\,N + CO_2}{5} = \frac{4 \times 0{\cdot}9714 + 1{\cdot}529}{5} = \frac{5{\cdot}4146}{5} = 1{\cdot}0829;$$

0·9714 being the density of nitrogen and 1·529 the density of carbonic acid; and it is the proportion of this mixture contained in the gases which will give the extent of the combustion. A graduation could be made of which the zero corresponds to $\frac{100}{100}$ of this mixture and to a normal combustion.



In the illustration A A are the two balloons; B is the receptacle containing air; and B^1, that to which the gas is supplied in a continuous manner by the pipe C. D is the vat full of cold water, and enclosing the two receptacles. E is the pipe serving for the supply of water to the lower part of the receptacles, and for the maintenance of an equal hygrometric degree of the gases. F are pieces of woven material hanging down into the water in the receptacles, and which (traversed by the gas or in contact with the air) saturate them with humidity. This description, joined to the explanations which precede it, will enable the working of the apparatus to be thoroughly understood. It indicates as a result the density, and in consequence the composition of the gases, in a continuous manner, and at each moment of production. It also permits, in the special case of combustion, and by means of the method pointed out, of the regulation of this combustion and the admission of air to the furnaces of steam-boilers, &c., either by hand or automatically by a suitable arrangement, comprising for example an alarm, register, &c. It can also be easily arranged to act in a mine containing fiery gases.

Coin-Freed Gas-Meters.—Carter, G., of Liverpool Road, Islington. No. 195; Jan. 3, 1894.

This invention relates to gas-meters fitted with coin-controlled mechanism (of the kind described in patent No. 21,819 of 1892); and it has for its chief object to construct the apparatus so as to be capable of being applied to any ordinary wet or dry meter, in such a manner that it shall not only automatically measure a quantity of gas equal in value to the inserted coins, but shall at all times indicate the amount of gas (if any) to the credit of the purchaser.

Fig 1

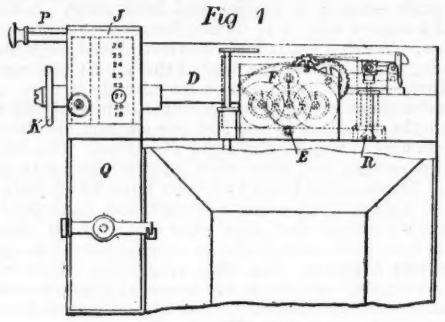


Fig. 2

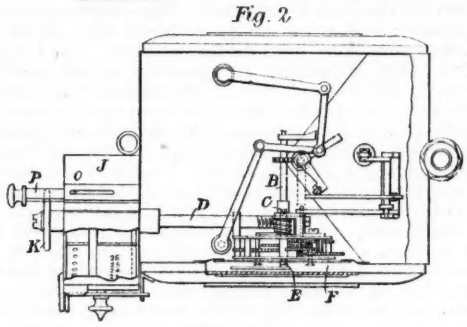


Fig 3

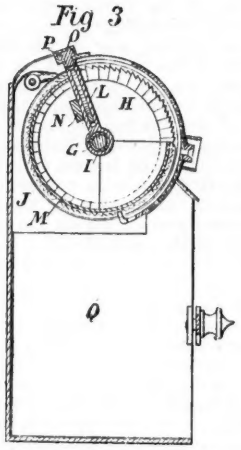


Fig. 1 is a front sectional elevation of the meter; the upper part of the front plate of the casing being removed. Fig. 2 is a plan; part of the casing of the coin-operating mechanism being removed. Fig. 3 is a transverse section through the coin mechanism, with the coin-arm in its initial position.

When applied to a dry meter, a worm A is mounted on the unit index spindle or arbor B, and gears with a screw-threaded pinion C, mounted on the threaded part of a sliding screwed rod D; the pinion being held in position laterally by cheeks, so that, as it is rotated, it imparts a longitudinal or axial motion to the screwed rod. Connected to, and partaking of, the longitudinal sliding motion of the rod is a sliding toothed rack, gearing with a corresponding toothed quadrant mounted on an arbor E, carrying an index-pointer working over an indicating dial F; so that, as the screwed rod slides longitudinally in either direction, the pointer is correspondingly rotated. The back end of the screwed rod D slides freely in the sleeve G of a gathering-wheel H, in which it is prevented from turning by a feather in the sleeve, working in a corresponding keyway in it. The wheel is of the crown-wheel type, and is formed with ratchet-teeth on its outer circumference or periphery, and also on its lip or flange—both sets of teeth facing in the same direction. On the sleeve G is mounted another sleeve I, terminating in a solid plug, which passes through a bearing in the casing J, and has securely mounted on it a milled disc K, by which it is rotated when desired. On the sleeve I is mounted a coin-receiver and feed-operator, comprising a casing L having a lever detent or bolt whose point is, in its normal position, held free of the teeth of the crown gathering-wheel H by a spring pressing upon its heel, but which, when the coin is pushed into the receiver, and the lever thereby

displaced, is forced outward by the lever, and engages with one of the teeth of the wheel H. Secured to the coin-receiver and sleeve I is a circular shield M, having a flange or lip on the side next the wheel H, and which projects a little above the ratchet-teeth of the wheel. The object of this shield is to prevent the wheel being tampered with from the money-slot on the top of the case J, and also to close the slot; so that no money can pass through when the receiver is not in its proper position to receive coins. On the back of the casing is secured a stop N, which ensures the stoppage of the coin-receiver, after displacement, in a proper position to receive a fresh coin.

Immediately above the coin-receiver, when in its initial position, is the coin-slot O, passing through the slide casing, in which slides a bolt or plunger P, which, when a coin is placed in the slot, forces it, in the act of closing, into the coin-receiver, causing it to depress the lever, and thereby press out the bolt lever, so as to cause its point to engage with the teeth of the gathering-wheel H. By this means, the coin-receiver and gathering-wheel are rigidly locked together until the coin is released from the receiver S, as will be readily understood. A strip secured to, or forming a part of, the outer casing J retains the coin in its operative position in the receiver during its rotation, so as to keep the lever-bolt in engagement with the wheel H until released therefrom.

The mode of operating the apparatus is as follows: Assuming there is no gas to the credit of the customer, the inlet-valve R will be closed, the screw-rod D will be at the end of its traverse, and the index-pointer will indicate zero. The slide P is withdrawn, the coin-receiver L is turned to its initial position, and a proper coin is inserted. The slide P is then closed, which forces the coin down the receiver-case, and puts the lever into engagement with a tooth of the wheel H. The coin-receiver is now rotated by means of the milled head K, until it strikes the stop, when the coin falls into the receptacle Q, and the lever is free to be again operated. The rotation of the wheel, and with it the screw D, will have now caused the latter to advance a corresponding distance forward, carrying with it the sliding-rack, and opening the inlet-valve R for the admission of gas; the translation of the rack also causing the index-pointer to advance and indicate the quantity of gas to the credit of the purchaser. Several coins may be inserted consecutively until the greatest quantity allowed for is standing to the credit of the purchaser—that is, until the rod has been advanced as far as it will go.

Generating Gaseous Fuel from Solid Hydrocarbonaceous or Carbonaceous Material.—Thwaite, B. H., and Threlfall, G., of Finsbury Pavement, London. No. 1690; Jan. 26, 1894.

This invention more particularly refers to apparatus for the production of gas for internal combustion engines, concerning which the patentees say: "The advantageous characteristics of the improved generator are numerous and important. It will, *inter alia*, permit the use of a coal having in its constitution a high percentage of the volatile hydrocarbons, and having also a high proportion of fusible or infusible slag or incombustible matter. These advantages permit the generator to be employed where the available fuel is the common kind of slack or bituminous coal, having as much as 30 per cent. of volatile matters in its constitution, or retort coke, such as breeze that contains as much as 25 per cent. of incombustible matter."

The cycle of operations in the generator, when using volatile hydrocarbonaceous fuel, converts the volatile and condensable hydrocarbons into permanent gas; and the construction of the grate, and means of approach to the fuel, enables the incombustible matters and residue from combustion to be rapidly cleared away. The amount of carbon dioxide in the gas produced is claimed to be lower than in ordinary gas-generators of other design. A further advantage claimed as a distinctive feature in the generator, is the recovery of the radiated heat from the shell or casing of the type of generator used for slack, bituminous, or hydrocarbonaceous fuel.

APPLICATIONS FOR LETTERS PATENT.

10,883.—M'Nair, J., "Drilling gas and water mains and other iron articles." June 5.

11,079.—Haddan, R., "Gas-stoves." A communication from L. Dathis, jun. June 7.

11,163.—Defries, H., "Gas-burners." June 8.

11,164.—Toope, C., "Gas or oil cooking stoves and ovens." June 8.

11,190.—Butterworth, E., "Gas or hydrocarbon engines." June 9.

11,256.—Ormerod, J., "Gas carburetting apparatus." June 11.

11,278.—Horwitz, M., "Burner for incandescent gas-light." June 11.

11,302.—Thompson, W. P., "Burners for incandescent gas-lights." A communication from A. Weber and Co. June 11.

11,365.—Lea, J. P., "Gas and oil motor engines." June 12.

11,432.—Stockman, G. N., "Cylinder to increase the illuminating power of gas in lighting railway carriages." June 12.

11,433.—Bass, T. J., and Andrews, C., "Adjustable sight-feed lubricator for gas-exhausters and other machinery." June 12.

11,456.—Bentley, G. H., "Gas or vapour engines." June 13.

11,481.—Paisley, J. R., "Exhaust of gas and other engines." June 13.

11,505.—Tylor, J. J., "Liquid-meters." June 13.

11,536.—Key, J. T., Holmes, J. W. C., and Holmes, P. F., "Double or single inclined retort for the destructive distillation of coal or other material, for the production of gas for illuminating and other purposes." June 14.

11,657.—Westcott, J. T., "Manufacture of water gas." June 15.

11,686.—Riley, T., "Gas cooking apparatus." June 16.

11,718.—Hill, T., "Utilizing the force of water in water mains or pipes." June 16.

Wilsden Water Supply.—The Wilsden Local Board are about to carry out a scheme of water supply, at a cost of £4100, by which the village will be furnished with water from the Thornton Moor reservoir of the Bradford Corporation.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Profit-Sharing System.

Sir,—I thank you for your good will and support; and I am much obliged for your statement in the last number of the Journal, showing the difficulties and objections in the way of the extension of our system of profit-sharing, which are probably felt by many who, like yourself, are in sympathy with the movement.

You say I "cannot get away from the sliding-scale." I will get away from it, and leave it behind at once, if anyone will show a better ideal or object to aim at than partnership, and also show a better, simpler, straighter, and more certain road to attain that end than the sliding-scale honestly and fairly worked. So far the sliding-scale has not failed; but, on the contrary, it is growing in popularity. Witness the Preston Gas Company's Bill just passed, where the opposing Corporation pressed for its adoption, and the Company not unwillingly assented. Further, it has answered its purpose of reconciling what were previously conflicting interests; while the prophecies of failure so freely indulged in at its inception, and especially during its discussion before the late Mr. W. E. Forster's Committee in 1875, when the whole gas interest of London, except the Commercial Company, was against me, have been completely falsified.

Has the sliding-scale put the gas industry into a "rut" which will only lead it further into the mire; or has it placed the industry on a line of rails that will lead it easily, safely, and straight in the direction of complete partnership? If it is in a rut, then let us get it out; but if it is on the line, give it more steam, and remove all obstructions. A great lawyer, the late Sir Henry Jackson, once said to me: "The law grows"—a very pregnant remark, which is equally applicable to gas and things in general; and you have given expression to the same fact by saying, in this connection, "The world moves." It is for us to note and assist the growth, and to ascertain the direction of the movement and aid it.

I am strongly convinced that we are moving towards partnership; and the more complete that partnership is, the better it will be for all parties. The mere mention of the word is evidence of the fact; for less than five years ago, when profit-sharing in connection with gas was first thought of, partnership could not be entertained. It was said: "Profit-sharing if you like; but special care must be taken that it gives no right to anything further—nothing in the shape of partnership;" and lawyers were consulted in order to make sure that there might be no danger of anything of the kind. But what do we see now? The idea of partnership between labour and capital is no longer dreaded, but, on the contrary, is being regarded with favour. It came forcibly to me in 1892, when, in giving evidence before the Labour Commission, one of the Labour members asked me whether I would stop at profit-sharing. I replied: "I do not know that I should." He then asked me: "Would you be prepared to allow the men, in the course of time, to get on to your Board, with a view of teaching them their business, and making them better men in every respect." My reply was: "I have thought of that; but the time has not come for it yet. But I should not regard it with any very great alarm, if it did come—in fact, there would be advantages in it. There are practical difficulties at present." Again, in the concluding observations of the final report of the Labour Commission, issued to day, there is this paragraph:—

> As the terms of what is virtually a partnership come to be better understood, and the arrangements for adjusting them to the variations of trade are made more perfect in one branch of industry after another, a natural end will be found to the conflicts which have been the result, for the most part, of uncertain rights, and mutual misunderstandings and pursuance of separate interests, without sufficient regard to their common interest, by employers and workmen.

Add the word "partnership" to profit-sharing, and call it "profit-sharing partnership," as it really is, and it is at once lifted to a higher level. Further, the investment of one-half of the annual bonus in the Company's ordinary stock, which is the latest development of the principle, and is now adopted by the South Metropolitan and Crystal Palace District Gas Companies, and some other concerns, makes the employees actually shareholders and partners; and this step taken, their representation on the Board in their right as shareholders is only a question of time.

If the employees are recognised as partners, then they have an equal right with the other partners—the shareholders and the consumers—to share the gain and loss that are caused by fluctuations in the market values of coal and products, over which none of them has any control. This will have a most valuable educative influence on the employees. I regard it as one of the most satisfactory items in our working and experience, that, in consequence of the rise in the price of coal necessitating an increase in the price of gas, the annual bonus to our people was reduced from 5 to 3 per cent. I contend that, as partners, the employees are entitled to participate in any unearned increment, as they also ought to bear their share in any undeserved decrement, equally with the shareholders and consumers, that is caused by fluctuations of market values, &c.

This, I think, answers your suggestion that we should "agree upon a standard price of coal, a standard gross profit, and connect these with the standard wages." But I have another answer. For three years—from 1886 to 1889—we tried to work on this system in connection with our officers; and we found it impracticable. The result was that we could make no variation in the rate of the annual bonus; and Directors and officers alike were very glad to get clear of this complicated, unworkable, and unsatisfactory system, by including the officers in the *simple*, easily understood, and fair system of sliding-scale, profit-sharing partnership, which was made to apply to all the employees, from the highest to the lowest, without distinction—thus creating community and identity of interest, not only between all classes of employees, but also with shareholders and consumers. This threefold cord will not be easily or quickly broken.

George Livesey.

Reigate, June 21, 1894.

Gas and Electric Lighting in Massachusetts.

SIR,—By the courtesy of Mr. F. E. Barker, of the Board of Gas and Electric Light Commissioners of Massachusetts, I have just received a copy of their ninth annual report;* and as it contains important facts which bear somewhat upon the brief discussion on carburetted water gas, at the last meeting of the Incorporated Institution of Gas Engineers, perhaps you will grant me space for a brief review of a few salient points in this interesting and comprehensive document.

In an editorial in the JOURNAL for the 12th inst., you referred to the large number of accidents and deaths due to inhaling illuminating gas in the State of Massachusetts; and I would point out that, of the 52 accidents reported, nearly one-half proved fatal, and of the 25 deaths recorded, no less than 23 occurred in Boston. Now, this is instructive, in view of the jocular manner in which Mr. Paddon referred to poisoning by water gas when discussing the papers read on enrichment. He stated that the Bay State Company, who supply Boston and the district, made three-fourths of the total quantity of carburetted water gas, or three times as much as all the other works in the State produced. The official report mentions that, of the 25 deaths reported, all but two occurred in Boston, and this where three-fourths of the total production of water gas is made and distributed. Yet the advocates of water gas would have us believe it is no more dangerous than coal gas. Turning now to the accidents by electricity, there are five persons reported as injured from electric light wires, three of them fatally; there being, in all, 85 companies who supply electricity, and 72 companies supplying gas. The combined dynamo capacity of the 85 companies totals up to rather more than 300,000 lamps of 16-candle power, or their equivalent, and the total number of gas-meters in use is 124,556—upwards of one-half being 3-lights. The aggregate results of the operations of the electric light central stations in the State for the year ended June 30, 1893, amount to $3,438,367; and the aggregate receipts for gas and products, to $6,132,329. From these figures, some idea of the relative business done in the Commonwealth of Massachusetts by gas and electric light companies can be inferred; and it seems a grievous fact that the deaths, in this one State, due to inhaling illuminating gas are over eight times as numerous as those due to electricity.

The average illuminating power of the gas supplied by the various companies, not including ten oil-gas companies, is 19·80 candles, and the average price charged in 1893 is 5s. 3½d. per 1000 cubic feet. The prices charged for electricity are often by contract, at a fixed sum for each arc or incandescent lamp. In Brookline, for instance, arc lights are charged from $65 to $100 per annum, according to the number of hours burning; and 16-candle incandescent lights, from $1·00 to $1·50 per month, according to the hours, or 1 c. per lamp-hour by meter. In Boston, 16-candle glow lamps are charged similarly 1 c. per hour by meter. From these figures it appears that lighting by incandescent electric lamps costs about twice as much as by gas, using ordinary flat-flame burners. It is therefore somewhat surprising to find that the relative aggregate receipts for gas and electricity during the year stand in the ratio of 5 : 3; showing what rapid strides in public favour electricity has made during the past few years. The increased receipts for electricity in the year amount to no less than $467,730; and for gas, to only $131,184. This indicates that, if the receipts for electricity increase at the same rate, it will not be long before they equal those received for gas. From these figures, it is apparent that the comparatively high charges made for gas in America, along with the methods adopted, have not tended to increase its popularity.

The competition between two or more companies in one district is not permitted, unless good and sufficient reasons can be adduced, which is very seldom the case; and the Board wisely revoked the permission granted by the City of Worcester authorities for a second company to erect poles and run wires for supplying electricity.

Stafford, June 23, 1894. J. F. BELL.

Income-Tax on Dividends.

SIR,—I shall esteem it a great favour if you or any of your readers can inform me what is the proper course to be taken under the following circumstances: An incorporated gas company, with a Special Act, is empowered to pay dividends at the rate of 10 per cent. per annum. It has been the custom to pay such dividends in full—that is, without deducting income-tax, which is paid by the company on the whole profits, in the ordinary way. Certain individual shareholders are desirous of claiming repayment of income-tax on the amount of the dividends received by them; and they call upon the Secretary for a certificate, setting forth the amount of such dividends. The questions arising are: Is it legal to pay such dividends without deducting the income-tax which has been previously paid by the company? If it is not, will the secretary be justified in assisting individual shareholders in obtaining the return to them of the proportionate income-tax? A shareholder who thus obtains the return of income-tax receives, on every £10, one pound *plus* sevenpence. In case of an examination of the Company's accounts, under Section 35 of the Gas-Works Clauses Act, would not the company be held to have paid dividends in excess of the "prescribed rate?" I find some provincial companies are in the habit of paying maximum dividends without deducting income-tax, while others deduct it. Any information on these points will be of great service to me.

June 20, 1894. PROVINCIAL SECRETARY.

The Guiding of the Large Gasholder at East Greenwich.

SIR,—We notice, in the account, in your issue of the 19th inst., of the discussion in the Middlesbrough Town Council on the subject of the new gasholder, you report Alderman Taylor as follows: "Since the opinion which had been quoted was given by Mr. Livesey, he had erected a gasholder, with a diameter of 300 feet, of 12 million cubic feet capacity, the two top lifts of which were rope-guided, and they had withstood the storms of last winter;" and the local papers further report him as saying that "the holder was a monument of the fact that guide-ropes must be as strong as columns." As the large holder referred to above, and which is the largest in the world, was erected by us, we feel ourselves called upon to correct such a statement; and we beg to point out that the two top lifts are not rope-guided—rope guides being both useless and unnecessary. No doubt the largest gasholder in the world would have been a splendid illustration and example of a rope-guided holder, had it been a fact that it was so guided; but we think, before making such a statement, it would have been better for Mr. Taylor, when getting the capacity of the holder, to have obtained a few more particulars, so that he might have been a little more accurate in his statements. The person who gave him the capacity of it we are sure would know that the holder was not rope-guided; and therefore he was giving him, or withholding, information which led to his misstatements. But no doubt it served its purpose. However, we wish to make it clear that the Greenwich holder is not "a monument of the fact that wire ropes are as strong as columns," but a proof that ropes as guides are absolutely unnecessary, and of no use whatever in the guiding of gasholders.

Leeds, June 20, 1894. CLAYTON, SON, AND CO., LTD.

Gas Companies and the Gas Appliances Trade.

SIR,—In the current issue of the JOURNAL, we notice another reply to the attack on the gas companies' policy with respect to the above matter; and again the defence is not by the assailed parties, but by a gentleman who apparently speaks purely in his position as President of the Incorporated Gas Institute, the members of which he was addressing, and not as one interested on either side. Mr. West, in this capacity, refers to the Association being formed to protect the interests of the trade; and he admits that the Association represent large numbers, and also that the members are "respectable." Hence the movement is presumably worth attention; and the proposals (when officially made) would, one would think, be entitled to due consideration. Mr. West, however, is evidently of a contrary opinion. At least he does not hesitate to give the prompt and bold advice: "Do not accept their suggestions;" and, so far as he is concerned, the matter is ended. But what do Mr. West's auditors say? These gentlemen, we presume, include engineers and officials of gas companies throughout the kingdom; and, judging from correspondence from many of these companies, the matter is not quite so easily settled, or so unimportant, as Mr. West imagines—in fact, the majority of the replies from the companies are favourable to a mutual arrangement, and many contain offers of assistance in securing this.

The fact is the gas companies cannot afford to dispense with the "trade;" and, in their own interests, they must secure their goodwill and assistance, in place of the existing animosity and opposition. The solution is a simple one—viz.: The companies to act as advisers, exhibitors, and lecturers—thereby creating a public demand—and leave the supply to the proper trading channels. Both parties would then work together in mutual accord, with infinitely more beneficial results to themselves and also to the public, who would be gainers by a wider variety of appliances and systems continually being improved by the impetus that would be given to invention.

Mr. West himself unconsciously suggests this very solution, as is shown by the following extracts from his address: (1) Legislative restrictions, "which, as a rule, are framed with the idea of being a benefit both to the undertakings and to the public generally"—naturally including the thousands of ironmongers, &c., who in many cases are the largest consumers, using the gas to promote the sale of appliances. (2) Companies "not only to make gas, but to undertake the responsibility of showing the consumers how to consume it economically;" and again, "they should be in a position to advise their customers as to the most economical and scientific way of using gas for all purposes." (3) "Many of the important ironmongers are pushing the sale of commodities which are in direct opposition to the interests of the gas industry." They would soon sell gas appliances, if they could do so at a fair profit. (4) "All of them were sold to customers, in the ordinary way of business, at a fair profit;" and again: "The writer has always refrained from going into severe competition with the trade; but he has endeavoured to sell them, as cheaply as possible, fittings and other things, so that they could make a profit for themselves." Precisely the basis of the proposed arrangement. (5) "A gas company does not care for the whole of the business, but only so much as will enable them to protect and further their own interests." (6) "The further questions of the letting out of cooking-stoves on hire, and of their being remunerative of themselves, are very debatable ones. My opinion is that the best plan is to sell the stoves out and out to the consumers." In regard to extracts 5 and 6, we say: Therefore divide the duties as proposed; and if selling or hiring out, do so at a profit on the ordinary business lines.

June 22, 1894. HERSEY BROS., LTD.

Water-Works for Ballycastle.—On the 21st ult., the new water-works which have been constructed at Ballycastle (Co. Antrim) were opened by Miss M'Gildowney. The supply of water to Ballycastle is obtained from two springs situated on the western slope of Knocklayde. The elevation is about 770 feet above sea-level, and about two miles distant from Ballycastle. The water is intercepted by means of two collecting-tanks, built of concrete, and provided with overflows. The water is then conducted by means of a line of 3-inch cast-iron pipes, for about a mile, into a pressure-tank, which is also built of concrete, and provided with an overflow and a valve for regulating the supply to Ballycastle. This tank is about 450 feet above sea-level, and is at a sufficient height to deliver water at a high pressure to the most elevated parts of the town. A line of 4-inch pipes is laid from the tank into Ballycastle for town supply. The water is then distributed along the different streets, and down to the quay. These pipe-lines are supplied with the necessary valves, fire hydrants, and fountains. There are about 2750 yards of 4-inch, and about 3220 yards of 3-inch pipes. The total cost of the works was £1028. The Engineer for the scheme was Mr. L. L. Macassey, of Belfast.

* The first of a series of articles dealing with the report appears in another part of the JOURNAL to-day.—ED. J.G.L.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress has been made with Bills:—

Bills read the first time and referred to the Examiners: Colne Valley and Central Middlesex Water Companies Bill, Harrow and Stanmore Gas Bill, Preston Gas Bill, Wakefield Corporation Bill.

Bill read a second time and committed: Plymouth and Stonehouse Gas Bill.

Bills reported: Bury Corporation Bill, Local Government Provisional Order (Gas) Bill, Neath Corporation Water Bill, South Hants Water Bill.

Bills read the third time and passed: Electric Lighting Provisional Orders Bills (Nos. 1 and 2), Local Government Provisional Order (Gas) Bill, Neath Corporation Water Bill, Southend Water Bill, Torquay Gas Bill, Wemyss, &c., Water Provisional Order Bill.

Bills Royal Assented: Millom Local Board Bill, Paignton Gas Bill.

HOUSE OF COMMONS.

The following progress has been made with Bills:—

Bills read the first time, and referred to the Examiners: Electric Lighting Provisional Orders Bill (No. 5), Gas Orders Confirmation Bill (No. 1).

Bills read a second time and committed: Huddersfield Water-Works (Tramroad) Bill, Pontypridd Water (Tramroad) Bill.

Bills reported: Cardiff Corporation Bill, Newcastle and Gateshead Water Bill, Swinton Local Board Bill.

Bills read the third time and passed: Aberdare Local Board Water Bill, Edinburgh and Leith Corporations Gas Bill, Harrow and Stanmore Gas Bill, Preston Gas Bill, Wakefield Corporation Bill.

A petition against the Huddersfield Water-Works (Tramroad) Bill has been presented from the Marsden Local Board.

HOUSE OF COMMONS COMMITTEE.

(*Before Mr.* JACKSON, *Chairman; Mr.* H. F. PEASE, *Mr.* PAULTON, *and Mr.* ROUND.)

Tuesday, May 29.

THAMES CONSERVANCY BILL.

On the resumption of the proceedings this morning,

Mr. *C. J. More* was recalled, and further examined by Mr. BAGGALLAY. He said that in 1866, when the Conservators took over the Upper Navigation, the locks, weirs, and works generally were in a most unsatisfactory condition. The weirs were nearly in ruins; and they leaked so badly that it was impossible to keep a sufficient head of water either for navigation or for mill purposes. So far as they allowed the water to escape, they were less efficient as reservoirs; and it was very difficult to maintain the purity of the water. Immediately after the passing of the Act of 1866, the Conservators commenced to put the works into repair, as far as the funds at their disposal permitted them to do so. They had spent about £45,000 on these things.

Mr. BAGGALLAY: In your opinion, have the works to which you have referred as being done by the Conservators had any effect upon the water supply?

Witness: Yes; I think they have had a very beneficial effect upon the water supply. They have tended to improve the water as well as the flow of the river.

By Mr. BAGGALLAY: The Conservators were still spending considerable sums in dredging the river above the intakes of the Water Companies. They had an income of about £24,000 a year, of which £12,000 odd went in the repayment of loans, establishment charges, lock-keepers' wages, and so on. About £6000 a year was required for ordinary repairs; and this left about £6000, which was spent either upon new works or in the reconstruction of old works. The last-named £6000 included £2000 payable under the Thames Valley Drainage Act All the works were more or less directly for the Companies benefit.

Mr. BAGGALLAY: You are aware, are you not, that it is proposed by the Bill to bring into account, in ascertaining the quantities of water they will take from the Thames, the water which may actually be pumped out of the gravel beds under lands immediately adjacent to the river? In your opinion, is that water which would find its way into the Thames?

Witness: It is water which is either intercepted on its way to the river, or water which, having once been in the river, is drawn through the gravel by means of any pumping which may take place in the beds. Therefore it is practically the same thing as taking water out of the river itself.

The CHAIRMAN: Do you know, as a matter of fact, to what extent or by how many Companies water is so taken?

Witness: The Southwark and Vauxhall Company obtain a very considerable quantity of water in that way; and I believe that there are several other Companies who do the same. There is no reason why they should not take practically an unlimited quantity, if this water is not to be included in the amount they are under agreement to take. They might draw their 130 million gallons collectively from the river itself, and another 130 million gallons from the adjacent gravel. At present, the quantities are not gauged in any way; and therefore the Bill made provision for the erection by the Companies of proper apparatus for measuring the quantity abstracted, including that which was obtained from the gravel beds within 500 yards of the river.

Mr. BAGGALLAY: You want actual returns of what is taken; and you also want power to enter the works from time to time to check the returns?

Witness: If necessary. That is not a power which one would probably exercise very much. You can always trust the Engineer of the Companies to give fair returns. They make returns already; and therefore they must have the appliances to enable them to do so.

The CHAIRMAN: What is the plan? Is there an automatic register of the number of strokes.

Witness: Yes, there is an automatic register of the number of strokes the engine makes; and then we are permitted to make a certain allowance for the slip of the engine—what they call the short strokes.

Mr. BAGGALLAY: In your opinion, is it desirable that there should be a penalty in the event of the Companies drawing more water from the river than they are entitled to take?

Witness: I think so, decidedly; otherwise nothing would restrain them from taking a very much larger quantity than that authorized. The Conservators were advised that, by an injunction, they might stop the Companies from abstracting too much water; but that is a remedy which they would be very loth to put in force, because it would cause a serious inconvenience. It would mean cutting off a portion of the water supply of London.

Mr. PEMBER: So would the penalty.

Witness: No, the penalty would mean your getting the water somewhere else, if you could not get enough out of the Thames.

Cross-examined by Mr. PEMBER: He had found no serious breach of the agreements between the Conservators and the five great Metropolitan Water Companies. It was only the Southwark and Vauxhall Company who abstracted rather more water than they had any business to take. The highest was 6,664,000 gallons a day beyond their proper quantity; and the lowest was 2,192,000 gallons. That would include the water taken from the gravel.

Mr. PEMBER: Then supposing that they are entitled to count that as distinct from the supply they get from the Thames itself, there would be no excess?

Witness: No.

Cross-examination continued: He had not the slightest reason to believe that the present method by which the Companies ascertained the amount of water which they were pumping was defective to any serious extent; and he believed that they made perfectly truthful reports. What he would like to have altered in their returns was that, instead of returning the average quantity per month, they should give the daily amount.

Mr. PEMBER: Supposing the Companies took 130 million gallons more than they do now—I am not suggesting for a moment that they would do so—would it, in your judgment, be a matter of much moment?

Witness: It would be of great consequence in very dry seasons.

Having been cross-examined at some length upon the evidence given by him before the Metropolitan Water Commission, witness said, in reply to further questions by Mr. PEMBER, that in his view the removal of floods from the Thames, and the prevention of the water spreading over the meadows, had not had the effect of diminishing the water in the gravel beds by the sides of the river. He admitted that a dilapidated or ruinous weir would not pollute the water; and that it was necessary to put the locks and weirs in order for the purposes of the navigation. In the amounts which he had given, he had not included the cost of the rollers which had been put in for the purposes of the pleasure traffic.

Mr. PEMBER: Did it add much to the cost of the locks and weirs to put in the tumbling-bays, which you say do, to some extent, aërate the water?

Witness: No, I do not suppose it added very much to their cost.

Cross-examination continued: The abolition of the floods was a very beneficial thing to the navigation, to the riparian owners, and to everybody concerned.

Cross-examined by Mr. LYTTELTON: He had never heard any complaint of the manner in which the Southwark and Vauxhall Company made their returns; and he did not suggest that they were not straightforward in every way. He only asked that, instead of giving the average amount for thirty days, they should give the exact quantity for every day.

Mr. LYTTELTON: When you say that the water drawn from the gravel by the Southwark and Vauxhall Company is really taken from the Thames, are you aware that the actual level of the water in the gravel is higher than that of the Thames?

Witness: No: I do not think it is. I have tried it myself, and have found it was not so.

Mr. *J. H. Gough*, recalled, then put in a statement showing that since 1866 the expenditure incurred by the Conservators above Staines had been £315,000 in respect of works and £184,240 for establishment charges and other expenses; and that between Staines and Moulsey it had been £110,000 for works, and £81,400 for establishment expenses, or a total expenditure above Moulsey, since 1866, of £690,640. This did not include any share which the Upper Navigation ought to bear of office and establishment expenses, except the contribution to the Conservators' allowances, which amounted to £10,000 a year for the whole river. The total contributions received from the Water Companies since 1866 had been £277,820, exclusive of the contributions of £1450 per annum payable under the agreements of 1852.

Mr. LITTLER stated that this concluded the Conservators' case.

Mr. PEMBER addressed the Committee on the joint petition of the Chelsea, Lambeth, Grand Junction, Southwark and Vauxhall, and West Middlesex Water Companies, in opposition to the proposals in the Bill affecting them. They offered, he said, the most strenuous objection to the new payment of £12,000 a year, and to any attempt to tamper with their present position as bodies entitled to abstract water from the Thames. He did not think the demand for additional contributions was quite frankly and honestly made, because it was clear from Mr. Gough's figures, as well as from his own admission, that the figures were only made up last January, after the deposit of the Bill, on instructions which were given to him in the previous December. No sane man could take any other view than that, looking about for an income for general purposes, the Conservators had determined to pounce, for a good round figure, upon the Water Companies, as bodies out of whom any amount of money could be taken, possibly with the goodwill of the public at large, who, to a great extent from ignorance,

were not very friendly to the Companies. They found, in fact, bodies that they could "bleed;" and they made up their minds to bleed them. He was perfectly willing to admit that the aëration of water, the subjection of it to light, and the consequent oxidation that went on, was an important matter in connection with the restoration of its purity; but that restoration of its purity had, unhappily, been taken away. The tumbling-bays had done something, though not very much, towards the purification of the river. Its real purification went on in its gradual progress towards the sea, from the point at which the impurity was first taken up. It was a well-established fact that a comparatively small number of miles of flowing would restore to something like its original purity and fitness for use, water which had been very considerably impregnated with impurity. He submitted that, with the exception of the tumbling-bays, there was not a single item among all those enumerated by Mr. Gough which was even indirectly connected with the purity of the river. They were matters appertaining essentially, first of all, to trade navigation; next, to the very important pleasure navigation and traffic of the Thames; and, lastly, to the general conservation of the river. What possible assurance was there that the enormous staff which had been suggested would ever be engaged, still less maintained? The Water Companies were not even to have a voice in the matter; and it would be open to the Conservators to go off with the additional contributions, and do nothing more than they were doing at present, which was, in fact, sufficient, because, whenever the quality of the Thames water was brought into question, the best answer that science could give had always been that the water, as served out by the Companies, was specially good. The very Commission that concluded its sittings last year came to the conclusion "that the water, as supplied to the consumers in London, is of a very high standard of excellence and of purity, and that it is suitable in quality for all household purposes." What excuse was there for adding to the payments of the Water Companies, which were already grossly excessive, and which would never have been put at the figure they had been if the two parties to the arrangement could have looked forward to what had occurred, and could have negotiated upon the basis of that knowledge. There was another very serious objection to the proposal of the Conservators—viz., that it was a breach of faith to now ask for 50 per cent. more than they had agreed to take in 1866 without giving the Companies a drop more water, but, on the contrary, trying, if possible, to cut down that amount. Then there was a third aspect of injustice in the case. The Bill made the payments imperative without legalizing the agreements. It not only made imperative the existing £20,000 a year by the five Companies, but it added another £10,000. The agreements themselves provided that the payments should cease when the power to take water ceased. Suppose the London County Council and the Corporation of London, who would be represented by 10 members out of 29 upon the Board of Conservators, urged so strongly that the validity of the agreements should be tested, that their demand could not be refused; and suppose, perchance, that the Courts of Law were to hold that the agreements were *ultra vires*, where would the Water Companies be? The instruction which had been given to the Committee was negative. It simply amounted to this; "Do not touch the question of taking water from the Thames; leave it alone." He ventured humbly, on the present occasion, to echo the instruction. Do not increase the payments of the Companies by 50 per cent., and not absolutely alter the conditions on which they were made. Do not make the payments perpetual without reference to the question of whether or not the Companies took water, especially as the Bill avowedly left it open to the Conservators, with their constitution amended as was proposed, to contest the power to take water. Do not say that the Companies were never to take more water than they took now. No Conservancy Bill had ever yet dealt with such a question; and rightly so. It was essentially a Water Bill question, and a vast one which could only be settled after exhaustive inquiry such as the Committee were hardly prepared to undertake at the present moment. In face of the legislation proposed in clause 289, how could the Water Companies come, with any chance of success, to Parliament in a year or two for storeage reservoirs, if in 1894 the Committee were to prejudge against them the question of their taking more water? The Committee could carry out their instruction to the letter by a few strokes of the pen; and he asked them to do so by striking out of the Bill these obnoxious, insidious, and one-sided clauses affecting the Water Companies.

Mr. CRIPPS, on the separate petition of the Southwark and Vauxhall Water Company, urged the Committee to reject so much of the original proposal of the Thames Conservators as was inconsistent with the instruction. When the Bill was originally drafted, the arrangement was that the Water Companies were not to take any greater quantity of water than that specified in the schedule. Then the instruction was moved to the effect that the Companies should not abstract any greater quantity of water than they could lawfully take at present. The Southwark and Vauxhall Company had no objection to legislation of that kind—viz., that the Companies should not take a quantity of water from the Thames, in any day of 24 hours, calculated from midnight to midnight, greater than that which such Companies might lawfully have taken on the 5th day of April, 1894, the date of the instruction. It was, however, inconsistent, he contended, to retain the schedule in the Bill, because at the present time the Southwark and Vauxhall Company were lawfully taking more than the quantity of water mentioned in the schedule, as they were entitled to draw water not merely from the Thames itself, but from the adjoining streams. He urged, therefore, that the instruction should be maintained, and that the Bill should not affect the rights of the Southwark and Vauxhall Company in the way of validating or invalidating their agreements, or, as regarding their present power, whatever it was, of lawfully supplying their district from the Thames. He therefore asked the Committee to reject, and to delete from clause 289 all proposals inconsistent with the instruction.

Mr. RICKARDS, on behalf of the Associated Water Companies, intimated that he could not accept the proposal.

Mr. BATTEN then addressed the Committee on behalf of the West Surrey Water Company, and urged that it was unfair to increase the contribution of his clients from £50 to £150 a year. The Company's district of supply was, he said, a very scattered one; and, having been in existence for a very few years, their dividends had only been at the rate of 1¼ per cent., whereas the additional payment sought to be imposed upon them by the Bill would amount at the outset to a tax of 10 per cent. upon their income. Hardship would also be inflicted upon the Company by restricting them to taking water only from the Thames itself. Having entered into a statutory agreement with the Company that they should for all time have the water at a certain price, and the Company having raised their capital upon this basis, the Conservators now sought to exact from them an amount treble to that which they had engaged to pay. This, he contended, was a breach of commercial morality.

The Committee then adjourned until the next day.

Wednesday, May 30.

On the resumption of the proceedings this morning,

Mr. CRIPPS, in order to remove any misapprehension as to his arguments on behalf of the Southwark and Vauxhall Water Company, asked leave to state that his contention was to strike out of the preamble the words "that provision be made with respect to the quantities of water which may be abstracted from the said river, or the immediate neighbourhood thereof, by certain Water Companies."

Mr. PEMBER: My learned friend and I are agreed in principle; but I go farther than he does, and say strike out the whole of the clause as to the payments, and also as to the taking of not more than certain quantities of water from and after April 5.

Mr. COHEN, on behalf of the London County Council, said that he opposed this part of the preamble in the first place because it had been proved beyond doubt that the contributions hitherto made by the Water Companies to the Conservancy had been applied to the construction of certain works which would not improve or purify the water at all—for instance, the repair of banks and towing-paths—and also to some works which, though they might improve the water, were at the same time absolutely necessary for the purposes of navigation, such as the construction of locks and weirs. Surely all these expenses ought, in justice and equity, to be shared between the Water Companies and the riparian proprietors and the inhabitants of London, to whom, of course, the condition of the river was a matter of paramount importance. In the second place, the Water Companies had no security whatever that the extra £12,000 or £13,000 asked for as contributions from them would be applied solely to improving the water. Looking at the past history of the application of the contributions, and the utterly insolvent condition of the Upper Navigation, there was an almost irresistible presumption that this could not be done. In the third place, there was not a single instance on record in which the Legislature had ever imposed any obligation upon the Companies to contribute a single farthing to the Conservancy. These were the three arguments which had been raised with much force and eloquence by Mr. Pember; and he must confess, on behalf of the London County Council, that he saw no answer to them. Mr. Littler had said it would pass the wit of man to devise any other scheme than that put forward by the Conservators, by which the money necessary for carrying out the proposed works, and for fulfilling the obligations imposed by the Bill, could be raised. His friend had not only shown a great want of imagination, but also a lack of what had been called, upon a celebrated occasion, "historical memory;" for a Select Committee which sat in 1884 had reported that the evidence brought before them went to prove that no further burden should be placed upon the Conservancy which involved any outlay of money, unless some adequate means of providing the money were at the same time furnished to them, seeing that the means at their disposal were not sufficient, without employing funds belonging to, and needed for, the Lower Navigation, for carrying out the necessary works on the locks, weirs, and towing-paths above Teddington. The result was that, in cases where any question arose as between a local claimant and some indisputable right on the one hand, and the interests of the public or the rights of the Conservators on the other, the latter endeavoured to avoid the contest; thereby encouraging the belief that the public right would not be defended. While it was certainly desirable that the funds at the disposal of the Conservancy should be more adequate to the duties to be discharged, the Committee did "not feel called upon to suggest the most appropriate manner of increasing the funds at the disposal of the Conservators, in order to enable them to discharge any new functions, or, indeed, to carry on the existing navigation." The Committee went on to say: "Among the various modes that suggest themselves are these: A small rate on the Metropolitan area; an increase of the water-rent paid by the Water Companies; a remission by the Crown of its claim on the Lower Navigation for £2500 annually; an increase of the tolls now paid by steam-launches, house-boats, and other pleasure-boats; and, finally, a small rate on the riparian counties and boroughs, in return for special immunity that may be accorded to them, in any future Act, from the consequences of conduct on the part of the public from which the ordinary law does not protect them." In these various modes, he (Mr. Cohen) contended, there could be levied a sum of money more than adequate to discharge all the important duties devolving upon the Conservancy. The truth was that the Conservators had not had the courage to come forward boldly and ask Parliament for the means necessary for the great work which must devolve upon them if they were adequately to discharge the important duties necessarily incumbent upon a body which had to manage the whole of the River Thames and its tributaries, and the great port of London. The Bill before the Committee was conceived in a niggardly spirit; and the whole matter would, sooner or later, have to be dealt with by Parliament on a broader basis. If the Committee should be of opinion that this part of the preamble of the Bill had been proved, he should hope to show that the clauses did not carry out, in a proper and satisfactory manner, the instruction given to the Committee.

Mr. PEMBER, on behalf of the East London Water Company, said that, on the general aspect of this part of the Bill, they adopted entirely the arguments which he had adduced on behalf of the associated Companies; but they were in a somewhat different position in this respect—that their rights to take water from the Thames were not regulated by

any statute or agreement whatever. Therefore their statutory powers, such as they were, remained absolutely intact. He urged in their case, as he had urged in that of the other Companies, that the Committee should leave things as they were.

Mr. LITTLER then replied upon the whole case. In doing so, he said the main desire of the Conservators was to deal honestly with the Water Companies, and not to take from them anything they had under their agreements. If the Committee decided that this was the right principle, they would only be too glad to introduce into the Bill words for the purpose of carrying it out. The Conservators admitted that what they intended to do under the Bill would not be all for the benefit of the Water Companies. The estimated cost which would follow as the immediate result of the powers sought for being granted was £10,494. Therefore inasmuch as expenses of this kind were likely to increase rather than diminish, the extra sum of £13,000 which the Companies were being asked to contribute did not seem at all unreasonable, more especially when it was remembered that in previous times they had always been called upon to contribute in respect of works, though the whole of those works did not benefit them. It was not pretended, on the part of the Companies, that they could not afford this very small payment of £13,000. If it were, he had only to point out that they had an aggregate capital of between £10,000,000 and £11,000,000. He ventured very earnestly to ask that the Committee would be pleased, subject to such amendments as they might think necessary, to pass the portion of the preamble of the Bill then under consideration, because it was of the most vital importance. The matter was small enough as bearing upon the Water Companies, or upon the consumers through the Companies; and he did not know by what conceivable process it could be suggested, even by the London County Council, that the Conservators could conveniently collect the money required except from the Companies. The barge traffic was already taxed; the pleasure traffic was taxed to a reasonable extent—quite as much as it would bear; and the Conservators had no other mode of getting money. They could not tax the Metropolitan counties; and they could not tax the county of London. For this purpose, special machinery would be required, which would have to be approved by the ratepayers of every different district upon which the money was levied. With every respect for the able advisers of the Companies, he could not understand their opposition, because, if they desired to be left alone in discharging their duties to the public, they could not have better support in the execution of those duties than the evidence that the whole of the Thames was being thoroughly cleansed, and the water made fit for drinking by the population of London. It seemed to him that this was far more for the benefit of the Companies than for that of anybody else.

The Committee then deliberated in private for about an hour. On the re-admission of the parties,

The CHAIRMAN said: The view of the Committee is that the preamble is proved. But they are of opinion that clause 289 will require to be carefully amended, and possibly re-drafted, in order, in the first place, to comply with the instruction of the House; and, in the second place, to safeguard the existing rights of the various Water Companies, as the Committee desire to do. In respect to the form in which this should be done, it appears to the Committee that possibly it might be desirable to have the clause re-drafted, and, if possible, agreed, in order to carry out the views of the Committee. With regard to the schedule, the Committee feel a little difficulty, until they see what form clause 289 will take, in deciding whether it is necessary. In their opinion, it would be desirable to put in quantities, if it can be done without prejudice to the rights of the Companies; but, as has been already pointed out, the schedule as it stands will not do. As to the payments, the Committee believe there will be imposed upon the Conservancy Board considerably increased duties, which will involve increased cost; but they consider that the amounts stated are too large. They think a further payment of £7500 a year, instead of the £13,000 asked for, would be reasonable for the additional works.

Mr. LITTLER: Of course, this question will have to be postponed?

The CHAIRMAN: Yes; so as to enable you to consider the matter.

Mr. LITTLER: We will try our best to agree with our friends.

Mr. POPE: If you will allow me a short adjournment, it is quite possible, speaking for the Southwark and Vauxhall Company, that we may be able to assist my learned friend in drafting a clause which will meet the views of the Committee.

Mr. COHEN: There is one clause which my learned friend Mr. Baggallay has almost agreed with me, on behalf of the London County Council—viz., clause 288. As the clause is at present framed, it would legalize the agreements made in 1886. I think my learned friend agrees with me. If not, I will satisfy the Committee that the proper way of framing that clause is to make it apply only to the agreements come to in 1878, when the intersale clause was inserted.

The CHAIRMAN: I think you have made that perfectly clear to the Committee.

Mr. COHEN: If you refer to the report of the Royal Commission, you will find that it was contended, on behalf of the Water Companies, that they could take any water they pleased under the agreements of 1886, on account of the intersale clause. So it becomes extremely important.

Mr. POPE: Whether or not my learned friend's contention is sound, the Companies maintain that it will be fair, at all events, that the intersale clause, enabling one Company to pass over to another, in aid of its quantity, the surplus within the 130 million gallons covered by the agreements, should apply.

Mr. COHEN: I thought my learned friend and I had come to an arrangement. If not, I shall have to trouble the Committee with an argument upon the subject.

Mr. POPE: All I understood Mr. Baggallay to agree to was that Mr. Cohen's contention upon the point of law might be accepted—viz., that, of course, agreements made subsequently to the intersale clause of 1878 were not covered by that clause.

Mr. BAGGALLAY: May I state exactly what my view upon the point is? It may or may not be that the only quantity to which section 15 of the Act of 1878 applies is the 110 million gallons. It may be that it includes quantities which are dealt with by the 1886 agreements. I want the clause to be in such a form that it should apply to whatever it would legally have applied to if this Bill had not passed.

Mr. COHEN: I have no objection to that.

Mr. BAGGALLAY: The amendment to the clause submitted by the London County Council did not save any agreements which might have been entered into between the Companies since 1878. It must save those agreements, if any. It must also apply to any quantity of water which, at the passing of this Bill, the Companies might lawfully have taken.

Mr. COHEN: We will see whether or not we can agree. If not, I must argue it.

Mr. BIDDER: There is one subsidiary matter with regard to the clause which we shall have to settle—viz., as to the allocation of the additional £7500 to be contributed by the Companies.

The CHAIRMAN: The Committee thought it would not be very difficult to find a method of apportioning the amount; and they did not wish to prejudice the case.

Mr. BIDDER: The Companies might arrange it among themselves.

The Committee then proceeded to consider other matters relating to the provisions of the Bill; and again adjourned.

Reduction in the Price of Gas at Sittingbourne.—After Midsummer Day the charge for gas in the Sittingbourne district will be reduced 3d. per 1000 cubic feet to private consumers, bringing it down to 3s. 6d.

The Site for the Electric Lighting Station at Chester.—The question of the utilization of the Hop-pole Paddock (which adjoins the Cathedral) for the electric lighting station at Chester was again before the members of the Town Council at their meeting last Wednesday week; and a resolution, moved by Alderman H. T. Brown, was passed, rescinding the motion agreed to by the Council on Oct. 11, determining that the Hop-pole Paddock should be the site for the works.

Mossley Corporation Gas Department.—The annual report of the Auditors upon the affairs of the Mossley Corporation Gas Department states that the revenue account for the past year shows a net loss of £370, as against £12 in 1892-3. This result is more than accounted for by the increased cost of coal (upwards of £1000), and arises from the high prices which obtained during the late miners' strike. The gas-rental shows an increase of £312; and the residuals, of £214. The increase in the gas-rental is chiefly accounted for by an advance in the price during the last quarter of the year.

The Price of Gas at Beverley.—In accordance with notice, Mr. Dixon moved, at the last meeting of the Beverley Town Council, that the price of gas be reduced 5d. per 1000 cubic feet; the present charge being 3s. 9d., with a reduction of 5d. for prompt payment. Mr. Dixon went into the question at some length, and showed that a total sum of £2081 had been taken from the gas profits during fifteen months to carry out other works in the town. He estimated this to equal 9 or 10 per cent. on the income of the works; and there was still a balance in hand of £1015. The motion was seconded; but it was afterwards agreed that the subject should be referred to the Gas Committee.

The Leeds Corporation Lamp Committee and Electric Lighting.—Last Thursday, the Lamp Committee of the Leeds Corporation had before them a letter from the Yorkshire House-to-House Electricity Company, requesting them to consider the desirability of illuminating some of the streets in the centre of the city with the electric light. In order that there might be a fair trial, the Company offered to supply the electric current for any number of arc lamps up to (say) 30 on the line of mains at 4d. per unit net. The Committee felt, however, that the proposal was somewhat untimely. It was pointed out that they had recently spent a large sum of money in fixing Bray's lamps in the principal streets; and therefore they would be scarcely justified in going to further expenditure at present.

Worcester Corporation Electricity Supply.—The Mayor of Worcester (Mr. G. H. Williamson) moved, at the last meeting of the Town Council, a recommendation of the Watch Committee that the price for the electric light should be fixed at 5d. per unit. His Worship made a long statement, in which he endeavoured to show that this figure would yield a very handsome profit in reduction of the rates, if the power they were providing was taken advantage of by the citizens. He pointed out that they were utilizing the water power of the Teme, which would be of great assistance in making the installation a profitable one. Electric pumping machinery was going to be fixed at the water-works for raising water to the higher levels, which would, as compared with steam machinery, effect a saving of £600 a year. If they could only calculate on 600-horse power being used for four hours a day for 300 days in the year, there would be, at 5d. per unit, a revenue of £7500. The present investment in the works was £46,000. After considerable discussion, the motion was agreed to.

St. Columb Water Supply.—The construction of new water-works for St. Columb has just been successfully completed. Previous to this undertaking, the supply was inadequate, uncertain, and unfit for drinking purposes, as it flowed to the town along an open ditch, and in its course became fouled by cattle and surface drainage. The drought of last summer produced a water famine at St. Columb. The Town Improvement Committee then took action; and after long and painstaking examinations into the merits of several schemes, adopted that known as the Ruthvos, as the water could be obtained from that locality—about two miles from St. Columb—by gravitation from pure and never-failing springs. The Committee employed Mr. Masterton, of Plymouth; and they were greatly assisted in their choice of the Ruthvos scheme by his advice. The plans provided that the water from the springs should be collected and piped into a small storeage reservoir, to contain about 18,000 gallons, or about one day's supply for a population of 1200. Thence the water is carried direct into St. Columb. The small reservoir is 365 feet, as against 349 feet at the head of the town; thus giving a head of 16 feet, which is sufficient to overcome the friction for the distance it flows. The old reservoir will only be used for waste storeage. The contract has been carried out to the entire satisfaction of the Engineer and the Committee.

MISCELLANEOUS NEWS.

THE PLYMOUTH CORPORATION AND THE GAS-WORKS.

The Suggested Purchase Negatived.

A Meeting of the Plymouth Borough County Council was held on Monday last week, under the presidency of the MAYOR (Mr. W. Law), when a report was presented by the Town Clerk as to proceedings in connection with the opposition to the Plymouth and Stonehouse Gas Company's Bill in the House of Lords, together with reports by Mr. Corbet Woodall, in which it was suggested that the Corporation should take steps with a view to the ultimate purchase of the Company's undertaking.

The Town Clerk (Mr. J. H. Ellis) in his statement regarding the proceedings before the House of Commons Committee said:

The Corporation's petition alleged (1) That the amount of capital to be raised was excessive. The Company did not meet the Corporation on this point; and in the result the Committee reduced the capital from £180,000 to £150,000. (2) That the loan capital should be offered for sale by auction. This was conceded by Counsel for the Company in opening his case. (3) That, having regard to the very large dividends which had been divided among the shareholders, the standard price was excessive. This contention failed. It appeared to the London Agents of the Corporation, to myself, and to Counsel, clear that it has for a long time past been contrary to the policy of Parliament to confer a monopoly on a private company, enabling them to earn such abnormally high rates of interest as have been received by the holders of Plymouth gas shares, and that, in justice to the consumers who pay these dividends, the standard price should be reduced. We are still of that opinion. (4) That the illuminating power of the gas supplied was too low. The Company strenuously resisted this contention; but the Committee raised the standard to 15 candles, as requested by Counsel for the Corporation. (5) That the Company should not be at liberty to apply for powers to supply electricity. The Company's Counsel abandoned the provisions of the Bill relating to electricity, so far as the Borough of Plymouth or the outside area—the subject of the borough extension proceedings—is concerned.

On minor points, the views of the Corporation have been met by the Company. The decision of the Committee makes it obligatory on the Company to raise £50,000 of loan capital before raising any more share capital. This decision is obviously to the advantage of the consumers. It is alleged that the Company can borrow money at 4 per cent. Interest on share capital would have been 5 per cent. at least; and probably, owing to the operation of the sliding-scale, a much higher rate. The Committee also, as desired by the Corporation, limited the amount to be brought forward as reserve. The limit fixed was £10,000. The whole of the objects of the Corporation, as disclosed in the petition, have been attained, except with regard to the standard price and capital. The capital authorized is still £45,000 more than Mr. Woodall thinks necessary; and the standard price remains at a figure which enables the Company to take far larger annual sums out of the pockets of the consumers than either equity or the state of the Money Market warranted.

There remains the important question on which Mr. Woodall has advised—viz., the acquisition of the Company's undertaking by the Corporation. Parliament has not unfrequently made it a condition that Bills of this kind should not proceed unless the promoters would insert therein a clause enabling the Corporation to purchase on terms. A similar provision in the Company's Bill would give the Town Council and ratepayers time to consider the question in all its bearings.

I desire to draw your attention to the claim put forward by the Company to the ownership of the gas-lamps supplied in Plymouth. This claim is untenable. The lamps are the property of the Corporation; and the Company are bound by their Act of 1855 to supply gas at rates not exceeding the lowest price charged to private consumers. It is common ground between the Corporation and the Company that the value of the gas supplied to each ordinary lamp is £1 8s. per annum. The Company's witnesses put the cost of maintenance, cleaning, and repairs at 18s. per lamp per annum. Mr. Woodall thinks 15s. is the correct figure. The contract price paid by the Corporation for the three years about to expire is £2 11s. 3d. per ordinary lamp per annum; for the three years immediately preceding the current contract period, the charge was £2 12s. 7d. per lamp per annum; for the then preceding three years, it was £2 13s. 11d. per lamp per annum. Taking the number of ordinary lamps as averaging 1300, it follows that, if the Company's witnesses are right, the Corporation paid the Company, in round figures, during the first period of three years, £1500; in the second period of three years, £1300; and that for the current period of three years it will pay £1000 more than they were entitled to. The number of ordinary lamps at the present time is 1400; so that during the next year there should be a saving on lighting account of from £360, if the Company's figures are taken, to £570, if Mr. Woodall is right. It would appear, from the Company's evidence, that the Directors have from time to time voluntarily reduced the charge for public lighting; and it may be that, on a proper communication being made, the Company will repay some of the money overpaid, even though the Corporation may have no legal right to insist on repayment.

In the absence of any overtures, or of any alterations in the resolutions of the Council, it will, I apprehend, be my duty to place the Corporation in a position to oppose the Bill in the House of Lords. I should be glad to know if I am to raise the question of purchase in the petition.

Mr. Corbet Woodall made two reports. One of the reports, dated April 4, dealt at length with the objects of the Company's Bill, and questions of capital, and so on, which had formed the subject of evidence before the House of Commons Committee. Referring to the clause under which the Company originally sought to obtain powers for supplying electric light, Mr. Woodall said:

My own sympathy is with the idea of one authority, and not two, being entrusted with the lighting of such towns as Plymouth. Undoubtedly, the cost would be far less, both of electricity and gas, if they were burdened with but one set of establishment charges. The cost of manufacture and distribution, as well as the capital charges, would also be lower on a combined undertaking. Holding these views, I cannot oppose the proposal of the Company; but I venture to make an alternative one. As the Corporation have decided to introduce electricity, should they not go farther, and take up the gas supply also? Unvarying success has attended the transfer of gas undertakings to Corporations; and the action your Council are now taking as to electric light furnishes a strong reason why they should entertain the question of purchasing the gas-works. I will not now discuss the general question, though I shall be happy to send a full report if the idea is favourably entertained. If an agreement could be arrived at with the Company that the Corporation shall buy, and the Company sell—say, within two years—the whole undertaking, upon terms to be arrived at by arbitration, I am strongly of opinion that the result would be eminently to the advantage of the Corporation and the town.

In a subsequent report, dated April 20, Mr. Woodall dealt more fully with the suggestion that the Corporation should proceed for powers to purchase the works, as follows:—

Upon the general policy of the acquisition of gas-works by municipal authorities, it is not necessary to say much. The wisdom of it has been proved by the experience of the large number of towns in which the supply has been for longer or shorter periods in the hands of the ratepayers. In the vast majority of these cases, the results have been eminently satisfactory to the consumers, while the ratepayers, as distinct from consumers, have also reaped substantial advantages.

Although, because of the high price generally paid by the purchasing body, considerable opposition has been frequently raised to the purchase and failure has been prophesied, I know of no case in which the results have not been such as to justify the transfer. It is natural that this should be so. Where the supply of gas is in the hands of the local authority, the consumer knows that any profit made upon what he uses comes back to himself in his capacity as a ratepayer; and this tends undoubtedly to a wider and more liberal demand. Although the monopoly of gas companies has been controlled and regulated by Parliament, yet there is still a general and natural feeling that if, for articles of universal use and sanitary necessity, there must be only one source of supply (that there shall be no competition), that source should be the municipality, and not a trading company. The low rate at which the local authorities can raise money as compared with companies gives the former great advantage, and tends to more economical production; while the cost of management in their hands is reduced by the saving of directors' and auditors' fees, and by the concentration of the official staffs and officers. The advantage of undivided control over the public streets is also a palpable reason in favour of the supply of gas by public authorities.

From a financial point of view, the success of the proposed transfer depends almost entirely upon a continued increase of the demand for gas. So far as regards the profit earned on the present business, that will be practically absorbed in the payment to the Company; and it is to the greater economy with which the increased business of the future will be met that the Corporation must work to their advantage. It is therefore of importance to determine what is the probability of the town continuing to grow, and with it the demand for gas. I have prepared some figures showing the growth of the Company and the relative position of the capital:—

Year.	Gas Sold.	Increase.	Per Cent. of Increase on Previous Years.	Capital Expended.		Dividend Paid.	
				Total.	Per Million Cub. Ft.	Per Cent. on Capital Expended.	Per 1000 Cub. Ft.
1883	358,089,000	..	10·48	£85,000	£237	9·86	5·60 d.
1884	382,732,000	23,643,000	6·58	91,000	237	9·33	5 32
1885	405,913,000	23,181,000	6·06	95,000	233	9·84	5·53
1886	440,692,000	34,779,000	8·57	95,000	212	10·16	5·26
1887	450,355,000	9,663,000	2·19	95,000	212	10·16	5·14
1888	475,472,000	25,117,000	5·58	95,000	200	10·28	4·93
1889	496,360,000	20,888,000	4 39	95,000	191	10·41	4·78
1890	508,523,000	12,163,000	2·45	95,000	187	10 41	4·67
1891	542,511,000	33,988,000	6·68	95,000	175	10·41	4·37
1892	585,228,000	42,717,000	7·87	105,000	180	10·38	4·15
1893	619,617,000	34,389,000	5·87	116,677	187	9·17	4 14

It is clear from this table that the demand for gas in Plymouth is a steadily increasing one; and I venture to express a confident expectation that the past rate of growth will be at least maintained. The use of gas for heating, cooking, and power purposes is far from having reached its full development; and this, I understand, is particularly the case in Plymouth. At the price of 1s. 9d. per 1000 cubic feet, gas consumed in a gas-engine costs only ½d. per horse power per hour. This is far less than the cost of steam for any but the largest or most perfect steam-engines; while the capital expenditure with gas-engines is much less than with steam. Further, the introduction of the automatic (penny-in-the-slot) meters has removed a great barrier which has hitherto stood in the way of the use of gas in small houses and cottages. One Company, and that not the largest in London, is fixing these meters at the rate of about 300 per week, and in houses where, without them, gas would never have been used.

While it is, as I have said, of much importance, if profit is to accrue to the purchaser, that the business should be an increasing one, it is of equal importance that the price paid shall be fair, not extravagant. In the short time available before the Company's Bill is in Committee, it is impossible to arrive at a true determination of the value. I therefore suggest that, if possible, a clause be agreed between the Company and the Corporation to the following effect: "If, within two years from the passing of the Act, the Corporation give notice of their intention to purchase the undertaking of the Company, the Company shall sell, and the Corporation shall purchase, upon terms to be agreed upon, or, failing agreement, to be settled by two arbitrators or their umpire. The arbitrators, in their valuation, to make no allowance for any value which may attach to the passing of the present Act." I do not propose this as a properly drafted clause, but simply as conveying the idea.

From the accounts of the Company, it appears that for the past four years the balance of revenue account has not been sufficient to pay the standard dividends. About £8000 has had to be drawn from the balance of profit and loss (net revenue) account to meet the deficiency. The price to be paid should be such that the Corporation will be able to pay interest upon the purchase-money and the sinking fund to redeem the same, out of the profit earned.

It may be a question whether, in view of the large addition now being made to the capital of the Company, the price of 1s. 9d. per 1000 cubic feet will not have to be temporarily raised. If this has to be done, it should not be delayed till after the transfer (should a transfer be effected), but should be faced at once. Assuming that there is an increase of 5 per cent. in the demand for gas in the current year, and that the capital is raised, as seems probable, to £200,000, then the charge for dividend will be 5½d. per 1000 cubic feet, as against 4·15d. in 1892. Against this there will be some economy in cost of manufacture, but not sufficient to cover this extra charge.

The Company have had, and still hold large reserves, which have been useful in the past to make up deficiency of profit. But the Corporation may not stand possessed of these; and the necessity to earn the expenses of the year out of the price charged is therefore more urgent in their case. These are questions which the arbitrator would have to consider. There are, however, no considerations in this case of such special difficulty as to make a transfer of the Plymouth Gas-Works less desirable than has proved to be the case elsewhere.

The determination of the Corporation to supply electricity is an additional and strong reason in favour of the transfer. Competition between a

public body having command of public funds and a private Company which is also a large ratepayer, seems hardly fair to the latter. Further, the competition, while it will do harm both to the Company and to the enterprise of the Corporation, will not really benefit the town. When prices are cut to the lowest, work is apt to be poorly done; and an agreement is usually arrived at after a time, under which the consumer has to pay back, in great measure, what he may have gained in the time of keen competition. The two supplies in the hands of the Corporation will each bear their fair proportion of expenses; and these will be far less, in the aggregate, than if two companies or the Corporation and the Gas Company divided the work between them.

On consideration of these reports, the Special Purposes Committee of the Corporation resolved—"That, in the opposition to the Bill in the House of Lords, the question of purchasing the Company's undertaking be raised, and that an effort be made to procure the insertion of a clause in the Bill enabling the Corporation to promote a Bill for the purpose."

Mr. J. T. Bond, in moving the adoption of the reports, said that, in accordance with a resolution of the Council, the Town Clerk was nstructed to oppose the Company's Bill in the House of Commons. In the first place, the additional capital which the Company sought to obtain powers to raise was £180,000. They were advised that this would be a great deal too much; and the contention of the Corporation so commended itself to the Committee of the Commons, that they had reduced the amount, and fixed the additional capital at £150,000. They believed, and were advised, that this was still too much by £45,000. Probably the Committee thought they would satisfy both parties by meeting them half way; and, with the usual result, they satisfied neither. At least £50,000 of the additional capital must be raised by auction—a fact which would have very substantial results so far as it affected the consumer. With regard to the illuminating power, by the Company's Act of 1879 this was fixed, after a very severe tussle, at 14 candles. This had been raised to 15 candles. As to the standard price, this was fixed at 2s. 6d. per 1000 cubic feet; but though they thought this was still too high, the Committee declined to alter it. They had also limited the reserve to £10,000. It had in the past exceeded this figure; and a large sum had been accumulated, which could either have been distributed in the way of profit, or in reducing the price of gas. The next point at issue was that dealing with the electric light, which the Company abandoned; and the Corporation were now alone endowed with the power to proceed with the electric lighting of Plymouth. As to the cost of the lighting of the streets, from the evidence given on the part of the Company, it was clear that £360 per annum was charged to the Corporation in excess of the price that should be paid for the public lamps. Their expert advised the Town Clerk that they were paying £570 a year too much. If they took the mean between the two sums, they would have about £450 a year, which they were paying in excess for the public lighting. They said this was a matter which would require the attention of the Council and of the Town Clerk at future stages of the Bill. These results, he thought, abundantly justified them in taking the judgment of the Committee of the House of Commons on the points at issue. As to the future, there were two questions to be considered—policy and finance. As a matter of policy, the Special Purposes Committee considered that the custody of the roads and highways of Plymouth, and the power to break them up, should be vested in the Council as the governing body of the town. The lighting of the public streets was a monopoly; and therefore it should also be, so far as it was a monopoly, vested in the Corporation. Unless the Council assented to this as a proposition, there would be a little inconsistency established. The light of the future—the electric light—was vested in the Corporation only. As to the lighting by gas—which, if not the light of the future, was certainly not likely to be an investment which was in any degree capable of shrinking in the future—he did not believe that gas undertakings were going to be any less than they were now, or had been in the past. As to acquiring the gas-works, any vote the Council might give that day could not possibly be in the nature of a decision which should bind the town to purchase the works. The Committee, however, believed that, if the opportunity that was afforded in 1879, during the passage of the previous Gas Bill through Parliament, had been embraced by the Council of that day, and the matter had been carefully and judiciously considered, and a decision to purchase the gas-works come to, it would have been a magnificent thing for the ratepayers of Plymouth. They had had no opportunity offered to them since then; and if the present one was not embraced, it was a matter of judgment as to how many decades would pass before a like occasion again presented itself. He believed it was a very valuable one, and should be used; and they would give their masters—the ratepayers—the power to say whether or not they should go forward with the matter. As to the financial side of the question, he pointed out that the Corporation could borrow money at 3 per cent., as against 4 per cent. which the Company had to pay, which on the estimated value of the property—say, £320,000—would mean upwards of £3000 per annum, or an advantage to the town of something like a 2d. rate. They could challenge criticism as to the management of their water property; and therefore there was nothing inconsistent in seeking to have control over the gas also. At any rate, if the Company were allowed to acquire the powers asked for, the matter could be thoroughly discussed in public, as the water question had been; and he had confidence in the result.

Mr. C. H. Radford seconded the motion.

Mr. Axworthy objected to incurring the expense of going to the House of Lords, as he could not see what they would gain. The gas at present was wonderfully cheap; and he did not think the Corporation would supply it any cheaper. He trusted that before five years had elapsed they would see the town lighted by electricity. The rates had just gone up 3d. in the pound; and the purchase of the gas-works would give them another 3d. This would be unbearable, and would drive some of the best people out of the town. He moved, as an amendment, that the Council proceed no further with the matter.

Mr. Godfrey seconded the amendment.

Mr. Bellamy said he was always on the lines of progress; but in this matter he must support the views expressed by Mr. Axworthy. If the proposal came from the Company, he could understand it; but he could not do so as coming from the Council. He quite agreed that the lighting of the town should be in the hands of the Corporation; but undoubtedly the light of the future was electricity. They all agreed that the gas supply had been well managed by the Company; and to transfer it at a time when it was probably about to be superseded by electricity, which was coming to the front "by leaps and bounds," was most inopportune. Under all the circumstances, he thought the proposal was a step backwards rather than forwards.

Mr. W. N. Elliott said the Company were now before Parliament asking for certain powers; and an opportunity occurred to the Council, in watching over the interests of the ratepayers, to have a clause inserted in the Bill to give them power to purchase the works within two years. This opportunity would not occur again for many years; and he urged that advantage should be taken of it.

Other members having spoken against the proposal,

The Town Clerk, in answer to a question, said that no member directly or indirectly connected with the Gas Company could speak or vote.

Mr. Bond, briefly replying on the discussion, said the members must not suppose they were voting for the purchase of the gas-works. The proposal simply meant authorizing the Council to take the initiative; and the rest of the proceedings would be discussed and decided by the ratepayers. He was convinced, however, that the gas-works would be a paying property, as the water-works were, because the town was growing. It might be twenty years before they had another opportunity of giving the ratepayers power to decide the question.

The amendment was withdrawn, and a vote was taken on the motion, with the result that it was negatived by 13 votes to 12.

The Town Clerk said the petition against the Bill had been lodged; but this had not entailed a large expense. Of course, the opposition could not now proceed any further on the purchase question. The points remaining were the cutting down of the capital, the altering of the standard price, and getting back the old payments. Practically these matters would come out in the opposition on the clauses of the Bill.

EDINBURGH AND LEITH GAS SUPPLY.

The Accounts of the Gas Commission.

The accounts of the Gas Commissioners of the Edinburgh and Leith Corporations for the year from May 16, 1893, to May 15, 1894, were issued last week by the Treasurer (Mr. J. S. Gibb). They show the stock capital to be £347,941; annuities, £33,800; and loan capital, £134,698—all the same as before. During the past financial year, the expenditure upon capital account was £4575; the amount of the account being raised from £497,450 to £502,125. The revenue account shows an income of £248,264, as compared with £260,310 in the year 1892-3. Of this sum, £224,982 was derived from the sale of gas, against £245,036; and residuals realized £22,910, against £14,959. The gas consumption was 1,271,143,000 cubic feet—an increase of 38,854,500 cubic feet. As compared with 1889-90, the first full year of the Commission's existence, there was an increase of 166,618,400 cubic feet. The coal carbonized was 131,980 tons, or 58 tons less than in the previous year; and the cost was £87,737, as compared with £112,808. Purifying materials, oil, &c., cost £6808; salaries and wages, £35,965; and repairs and maintenance of works, £8357. The corresponding figures for the year 1892-3 were £6487, £35,911, and £9596. The total charges for the manufacture of gas were thus £138,868, as compared with £164,803. The distribution of gas cost £21,359, as compared with £20,471; management cost £6725, as compared with £6508; feu duties, rates, and taxes came to £7334, as compared with £11,194; law and parliamentary charges, to £245, as compared with £193; pensions and allowances, to £789, as compared with £842; and discounts, abatements, and bad debts, to £5538, as compared with £6612. The total expenditure amounted to £180,862, compared with £210,625; and the balance remaining was £67,402. Mr. Gibb's summary of the accounts shows that from this sum there is to be provided: Annuities, £33,800; amount transferred to the sinking fund, in respect of annuities redeemed, £200; interest on mortgages, &c., £4731; expenses of renewing mortgages, £458; together, £39,189. After meeting these charges, there is left a balance of £28,212. This is further subject to the statutory minimum charge for the sinking funds as follows: (1) For payment of money borrowed, £1347; (2) for redemption of annuities, £7224—total, £8571. Taking away this statutory minimum charge would still leave a balance on the year's working of £19,641, which, added to the free balance from last year of £29,668, makes a sum of £49,309, which may be dealt with at the discretion of the Commissioners—whether by placing it wholly or in part in the sinking funds, in the reserve fund, by writing down the suspense account, or by carrying it forward. The sinking fund amounts to £47,409; and the reserve fund, to £2826. In the gas-stove account, which was instituted in 1892-3, it is shown that during the past year £1597 was expended in the purchase, and £342 in the repair and fitting up, of stoves; and that the revenue was: For hire of stoves, £459; for stoves sold, £153; and for fitting up stoves, £244—a total of £856. In the preceding year, the revenue from gas-stoves was £490. The capital value of the stoves in stock rose during the year from £1998, to £3081. The accounts have to remain for a month before being submitted for approval.

The Increased Charge for Public Lighting by The Gaslight and Coke Company.—"Some people are greatly puzzled," says the *Local Government Journal*, "to know why The Gaslight and Coke Company are going to reduce the charge for gas to private consumers and increase it for public lighting. They cannot see why the latter should pay more than the former. Apart from the prosaic fact that the charge made for public lighting includes lighting the lamps, cleaning the lanterns, &c., there is the question of risk, which the local authority does not run, and, therefore, pays for security. For the lesser charge, the consumer has the privilege of leaving a tap turned on all night in a shut-up room, and being nearly asphyxiated when he enters it; also the delirious delight of searching for an escape of gas with a light, and wrecking his house and sustaining personal damage."

BUENOS AYRES (NEW) GAS COMPANY, LIMITED.

The Annual Meeting of this Company was held last Tuesday, at the London Offices, 1, East India Avenue, E.C.—Sir WILFORD BRETT, K.C.M.G., in the chair.

The SECRETARY (Mr. E. W. Layton) read the notice convening the meeting; and the report and accounts for 1893 were then submitted (see *ante*, p. 1134).

The CHAIRMAN said that the shareholders would have gathered from the report that, notwithstanding the severe financial crisis, which so seriously impaired the trade and industry of the Argentine Republic, the improvement in the business of the Company had not only been maintained, but it exhibited a marked advance over the preceding year. Satisfactory as this was, he had to set against it the depreciation of the currency. Consequently, the final financial result was that, whereas the gross receipts had been no less than $1,997,212 and the net profit $1,175,219, after the adjustment of all currency items in the accounts to the sterling value, the profit was whittled down to £24,979, which was then an improvement of £13,394 upon 1892. From the profit of £24,979, they had to deduct the debenture interest of £12,000, which left £12,979 to be dealt with. The Directors recommended a dividend at the rate of 2 per cent., free of income-tax, 1 per cent. of which had already been paid. This would leave a balance of £2979 to be carried forward. They would have been glad to have been able to propose an additional ½ per cent.; but, in view of the slow development of the business in South Barracas, and the violent fluctuations in the gold premium during the current half year, it was felt that, in the interests of the Company, they could not properly do so. The Chairman referred at some length to the situation of the country both politically and commercially, because, he said, there could be no doubt that variations in these respects did largely affect the interests of the Company, in the influence they had in the fluctuations of the premium on gold. Proceeding, he remarked that what he desired to impress upon the shareholders on the present occasion was that the earning powers of the undertaking had not only not decreased, but had increased, as was seen by the figures he had quoted as to the gross receipts and net profits in dollars for the year; and it went to show that the Manager (Mr. Lewis T. Wright), who was with them that day, had fairly done his duty by the Company in the way in which he had conducted the business at Buenos Ayres, and that all the difficulty and disappointment had arisen really from the trouble of getting home the gold—in other words, from the high and fluctuating premium on gold. There was another difficulty they had had to contend against during the year, and that was the local competition. This had taken the form of heavy discounts, liberal concessions, and even the presenting of gas-fittings to their consumers, in order to tempt them away from the Company. He need hardly say that they could not follow in such steps as these. But the policy they had adopted to counteract these influences had been to fully maintain the good quality of the gas; and this had so far succeeded that 126 consumers, 70 of whom were taken away by the competing companies, had now returned to them. However, the number of meters in use on Dec. 31 last was 10,777, which was a gain of 256 during the year. He thought the shareholders would admit that this was satisfactory, considering the great competition they had to face. Of course, this evil told, in a small way, on their bad debts, because the consumers, being tempted away to other companies, forgot to pay their accounts; but, in the present state of competition, he did not see how they could absolutely control this. Notwithstanding, the bad debts were less by $16,020 than in 1892. This reduction was largely due to the use of service-taps, which their Manager had introduced and used as far as possible. In the management, the policy of the Directors had been, from the first, to reduce expenditure wherever they could; and he must say that their Manager had amply helped them in this respect, and with the following most satisfactory results: The cost of the gas manufactured was less than in 1892, though a much larger quantity had been produced. The cost of coal, although 1033 tons more had been carbonized, was less, arising from the smaller quantity of New Boghead employed, lower freights, and the use of a cheaper coal. The item of purifying was also less than in 1892; and he believed it would be still further decreased this year. This was owing to improvements introduced by Mr. Wright, and to the discontinuance of the use of lime, which was rather expensive. The carbonizing expenditure had been a little higher; but this was due to the pressure put upon the Company by the stokers for an increase of wages, which the Directors could not, under the circumstances at the time, resist. The retorts had been put in first-class order; and they had now 290, capable of producing 1¾ million cubic feet per day. Another thing which had enabled them to save was the purchase of a portable railway, by means of which they conveyed the coal from the sheds to the retorts during the daytime. Formerly they had also to work part of the night; and thus they had saved the expense of lighting, and, in wages alone, from $300 to $600 per month. The item of residuals was higher than in 1892; and their sale had been so successful, that, if it went on as it had been doing, the Directors hoped to gradually raise their price. The quantity of gas sold to private consumers showed an increase of 10,068,000 cubic feet over 1892, which was very satisfactory. The meter-shop, in which they made their own meters, had been a most useful branch. As many as 2498 meters had been repaired and 564 new ones made during the year; and in this work they had been able to use some of the material of the old meters; so that their meter arrangements might be considered particularly satisfactory. It would be interesting to the shareholders to know that, in spite of the heavy depreciation of the currency, the remittances from 1889 to 1893 had exceeded those of the previous five years (1884–8) by £77,506 sterling; showing that the earning power of the Company had been far from unsatisfactory. Having expressed his regret that the Manager had, for family reasons, been obliged to retire from the Company's service, the Chairman mentioned that the Directors were now inquiring into the question of employing oil for the enrichment of gas, in order to save, to some extent, the expense of cannel. He then concluded by moving the adoption of the report and accounts.

The MANAGING-DIRECTOR (Mr. F. J. Heseltine) seconded.

Mr. S. SPENCER asked for some information as to a paragraph in the Auditors' report with reference to the South Barracas Gas Company. He noticed that the amount standing at the debit of the Company had now grown up to £9133.

The CHAIRMAN replied that the Company really undertook that matter, in order to keep other people out of South Barracas. When they instituted those works, they naturally hoped that building operations would have gone on there to a large extent; but, as a matter of fact, the depression that existed everywhere had affected South Barracas, and no new buildings had as yet been erected—the result being shown in the item mentioned.

Mr. E. H. D'AVIGDOR remarked that he was glad to notice from the report the unusual economy which seemed to be carried out by the Company in the Argentine Republic, where he knew it was extremely difficult to practise economy. The statement in the report as to the receipts and profits struck him as being very remarkable, when he considered that, in other gas companies, they were pleased if they could get home 45 per cent. of the receipts; but he found that they had brought home nearly 60 per cent.—in other words, the working expenses formed a little over 40 per cent. of the total receipts. For a Company that worked at a distance of 6000 miles, this was an extraordinary achievement; and for this they ought to be grateful to their Directors at home, and their Manager at Buenos Ayres.

Mr. ROKEBY PRICE, referring to the return home of Mr. Wright, asked what provision the Directors had made for the management of the Company's affairs at Buenos Ayres.

The CHAIRMAN said he need not state that it was a most difficult thing to find a fit successor to Mr. Wright. The Directors were looking out in every direction; and they had had a good many applications. It was really the summer period now; so that they could take care of the works. He was quite satisfied that they were safe for the present; and in this opinion he was fortified by that of Mr. Wright.

The report was then adopted; and the dividend recommended by the Directors was declared.

Resolutions were next passed re-electing the retiring Directors (Sir Wilford Brett and Mr. Robert Nesham), and the Auditors (Messrs. Turquand, Youngs, and Co.).

Mr. WRIGHT, being invited to address the meeting, remarked that he hardly knew what to say after the able address of the Chairman; but, speaking briefly, he thought he could congratulate the shareholders, if not upon a very high dividend, at least upon having the undertaking in a very sound financial condition. Since he joined the Company, the business had been increasing; but if they had not been making a proportionate profit, that was due to the immense depreciation of the currency which had occurred during the last five years. When he went out to Buenos Ayres, they could buy a sovereign for seven paper dollars; but it now took 20 of those dollars to remit a sovereign to London. This had been a very severe depreciation to battle against; but, in spite of this, they had been able to work the business up to such a position that, with a diminution in the competition between the various Companies (which he hoped would take place), he thought they would be able to bring the Company somewhat up to its old circumstances. The great depreciation of the currency made them feel the competition more, because certain of the Companies held their capital in paper and not in gold. Perhaps this would be difficult for some of the shareholders who were not acquainted with the currency to understand; but the shareholders of a company holding their capital in paper were content with the same paper dollar that they were content with before.

The proceedings concluded with the usual recognition of the services of the Chairman and Directors, the Local Committee, and officers.

OLDHAM CORPORATION GAS SUPPLY.

Annual Report.

The report of the Oldham Corporation Gas Department for the year ending March 25 last has been issued. From it we learn that the gross revenue amounts to £132,421; and the expenditure, to £119,404—the balance carried to profit and loss account being £13,016. The annuities during the year amount to £3563; the interest on loans and stock, to £8818; and the sums payable to the respective sinking funds, to £5809—making £18,190. The sum to which the Corporation are entitled in aid of the borough fund is £6445, which brings the total to £24,635, and leaves a debit balance of £11,618. The quantity of gas supplied to the street-lamps and municipal buildings free of cost during the year is 61,215,400 cubic feet. The benefit to the borough fund for gas thus supplied, based on its selling price, is £6651; and the amount to be paid over in aid of the borough fund, as stated above, is £6445—giving a total sum of £13,096. The fittings account shows a profit on the year's transactions of £532. The price of gas per 1000 cubic feet and also the discount allowed therefrom if paid within the stipulated period during the past year have been as follows: For the period ending Nov. 1, 1893 (within the district of supply), when the quarterly consumption was under 2 million cubic feet, 2s. 10d., with a discount of 6d. per 1000 cubic feet; 2 million and under 5 million cubic feet, 2s. 9d., discount 6d.; 5 million cubic feet and above, 2s. 7d., discount 6d. For the period ending March 25, 1894, when the quarterly consumption was under 2 million cubic feet, 3s., with a discount of 6d.; 2 million and under 5 million cubic feet, 2s. 11d., discount 6d.; 5 million cubic feet and above, 2s. 9d., discount 6d. The quantity of gas manufactured at the different stations during the year was: Oldham, 166,050,000 cubic feet; Higginshaw, 411,556,000 cubic feet; Hollinwood, 350,607,000 cubic feet; and Royton, 48,693,000 cubic feet, or a total of 976,906,000 cubic feet, against 871,177,000 cubic feet in the preceding year—the quantity of cannel and coal carbonized in its production being 96,846 tons. The average quantity of gas made per ton of cannel and coal carbonized during the year was 10,087 cubic feet. The loss of gas from leakage, &c., has been 59,603,000 cubic feet, or 6·101 per cent. of the quantity made. The maximum quantity of gas delivered in 24 hours was on Dec. 29, 1893, 6,396,000 cubic feet,

as compared with 4,479,000 cubic feet last year—showing an increase of 1,917,000 cubic feet. The minimum quantity of gas delivered in 24 hours was on June 18, 1893, 687,000 cubic feet, against 700,000 cubic feet in the previous year, or a decrease of 13,000 feet. The average illuminating power of gas supplied has been equal to 19·3 candles. During the year 690 new meters were fixed, and 682 consumers added. The total number of meters now in use is 45,477; and the number of consumers is 44,481. The late coal strike necessitated the purchase of 29,554 tons of coal at enhanced prices; the cost of the gas manufactured being thereby increased by about £15,400.

BURY CORPORATION GAS SUPPLY.

The Manager's Annual Report.—Reduction in Price.

The Gas Committee of the Bury Corporation presented, at a recent meeting of the Town Council, the annual report of the Engineer and Manager (Mr. W. H. S. Gendall). In the course thereof, he stated that, owing to the exceptionally mild and light season, the consumption of gas in the financial year ending the 31st of March last increased by only 996,525 cubic feet, or 0·003 per cent. The unaccounted-for gas had, however, been reduced by 1 per cent. Owing to inadequate coal storeage, the additional expense attending the trouble in the coal trade necessitated an advance of 4d. per 1000 cubic feet in the price of gas; but the extra room since provided would, he thought, prevent a repetition of anything of the kind. The total quantity of gas made was 294,186,000 cubic feet. Of this quantity, the private consumers burnt 249,877,700 cubic feet, 23,355,600 cubic feet were employed in the public lighting, and 3,702,600 cubic feet were used on the works—making together 276,935,900 cubic feet, and leaving 17,250,100 cubic feet, or 5·8 per cent., unaccounted for. In the preceding year, the loss by leakage, &c., was 20,370,625 cubic feet, or equal to 6·8 per cent. During the past twelve months, 52 new lamps were connected to the mains—making a total of 2062; and 120 cooking-stoves were hired, which raised the total to 428. Mr. Gendall thought that, if stoves and gas-engines could be brought more prominently before the ratepayers, a great benefit would be conferred upon them, and the output of gas would be increased at the time the mains were practically idle. Prepayment meters to the number of 65 were fixed last year; making in all 92. Mr. Gendall is putting forth great efforts to bring these meters more prominently before the non-consumers; and he hopes, when he presents his next report, to be able to state that there is no house in Bury unsupplied with gas. The mains were increased last year; bringing up the total to 124,958 yards, or 70 miles 1758 yards. The report contained the following working statement:—

Cost of manufacture, distribution, management, &c., per 1000 cubic feet of gas sold	2s.	9·16d.
Less Tar	1·75d.	
Sulphate of ammonia	3·16	
Coke	6·24	
Sundries, meter-rents, &c.	0·57	
	0	11·72
	1	9·44
Add interest on loans and stock, and sinking fund contribution	0	7·86
Net cost per 1000 cubic feet of gas sold	2	5·30
Net amount received for gas	2	6·45
Profit	0	1·15

The estimated cost of gas for the current twelve months is put at 2s. 4d. per 1000 cubic feet sold. During the past year, the plant for the distillation of tar was finished, and the work started; and £621 more was made in this way than if the tar had been sold in the open market. The coal elevator and conveyor were also completed; thereby allowing 12,000 tons of coal, or 60 days' supply in mid-winter, to be stored. The coal can now be unloaded at a cost of ½d. per ton; the total cost of bringing it from the railway siding being about 1½d. per ton. Mr. Gendall concluded his report by stating that the works were in a condition to turn out an increased production of gas as soon as the demand for it arose, and by complimenting the men on their excellent conduct during the coal crisis. The year's working resulted in a profit of £1322; and this satisfactory position of affairs has enabled the Committee to take off the 4d. put upon the price of gas.

BINGLEY IMPROVEMENT COMMISSIONERS' GAS SUPPLY.

Annual Statement.—Reduction in Price.—Progress of the Undertaking.

At the Monthly Meeting of the Bingley Improvement Commissioners on Monday last week, the Chairman of the Gas Committee (Mr. Gatecliff) submitted his annual statement, from which it appeared that during the year ending March 25 last 65,975,200 cubic feet of gas had been made, with a leakage of 4,224,100 feet, or 6·40 per cent., against 5·91 per cent. in the previous year. The total sales of gas amounted to 61,251,100 feet, for which the sum of £9841 was received. The value of the residuals produced equalled 44·02 per cent. In the maintenance account, the sum of £507 had been expended, as against £1083 in 1893. This discrepancy was explained by the fact that there had been no new mains laid; and the adjustment of the wages had been more carefully dealt with. The average price of gas was 2s. 11d. per 1000 cubic feet, less 15 per cent. The net profit on the works was £91, although the Commissioners had spent £800 more for coal owing to the miners' strike. Mr. Gatecliff also mentioned that in 1893 they had on hire 147 gas cooking-stoves, with a rental of £17; while at the present time they had 360, at a rental of £48. The gas consumed by these and gas-engines amounted to 5,482,600 cubic feet, or £651 net; and from this source alone, there was a net increase of £434. The capital invested in cookers, meters, and fittings, and paid for out of the reserve fund, was £2139. He pointed out that but for the gas cooking-stoves, the Commissioners last year would have had a serious loss, instead of a profit of nearly £100. In dealing with the progress of the works since 1875, he said they had paid to the rates £8595; from the reserve fund to extensions up to 1893, £1285; and from the same source during 1894, the sum of £1179. In the reduction of the capital account by the sinking fund between 1875 and 1894, they had paid £26,203; and they had a reserve fund of £455. The present capital invested in the works was £23,803. In conclusion, he recommended the Committee to reduce the price of gas 2d. per 1000 cubic feet for illuminating purposes only. He thanked the officers for the able assistance they had given him; and he recommended the Commissioners to grant their Engineer (Mr. G. D. Malam) an increase of salary for the arduous duties he had performed during the coal strike. The report was unanimously adopted.

It may be of interest to give a few additional figures in regard to the progress of the undertaking since 1875. In that year, the capital invested in the works was £41,353; and the quantity of gas sold, 28,118,000 cubic feet—being equal to £1 9s. 4d. per 1000 cubic feet. Now the invested capital works out to 7s. 9d. per 1000 cubic feet of gas sold. Leakage has been reduced from 12·99 to 6·40 per cent.—a saving of 6·59 per cent. The price of coal in 1875 was 12s. 1d. per ton; of coke, 6s. 8d.; of tar and liquor, 13s. 6d. These figures are now 12s. 7¼d., 8s. 7d., and 8s. 7¼d. In 1875 the works had room to store 200,000 cubic feet of gas; now they can store twice this quantity. The number of retorts has been increased by 20, and the length of mains by 13¼ miles; while the purifying apparatus has been quadrupled. The estimated structural value of the works has risen from £20,000 to £37,800; and whereas in 1875 there was a net loss of £340 on the working, there is now a net profit, as stated above, of £91. It may be mentioned that meters are supplied free for cookers, fires, and gas-engines.

RUSHDEN AND HIGHAM FERRERS GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held on Monday ast week, when the Directors reported a satisfactory balance of profit on the working in the twelve months ending the 31st of March. Our readers may remember that the new works of the Company were opened in April, 1893; and the plan and description of them appeared in the JOURNAL for the 25th of that month (p. 736). In their report, the Directors stated that they felt that the year just closed, being the first with the new works in full operation, and also the first in which the trading account had had to bear the full burden of the large expenditure—amounting to £18,200—incurred for them, would necessarily be somewhat of a test year; and consequently they regarded with gratification the fact that they were able to recommend a dividend of 5 per cent. The cost of the old Rushden undertaking now stands at £3630, from which there is still to be deducted a sum of £900 made by the sale of the site, and such further money as may be realized by the disposal of plant not required at the new works. The cost of the Higham Ferrers undertaking amounts to £1161. A sum of £200 brought forward last year as undivided profits from the old Rushden Company has been written off that concern; and it will be the policy of the Directors to continue to write off annually a certain sum from both of the old undertakings, so that, in the course of time, they will no longer appear as assets in the general balance-sheet. They have also thought it wise to write off £100 from the cost of the new works; and they have included, in the item of "Repairs and maintenance" in the revenue account all service fittings put in during the year. The siding from the Midland Railway into the works has been completed; and, as a result, the item for carting amounted last year to only £45, against £208 in the previous twelve months. The cost of coal was £1747, as compared with £1698; but the sales of gas rose from £2977 to £3431, and the receipts from residual products, from £429 to £638. The cost of coal thus increased by only £49; while the gas-rental advanced by £444, and the sales of residuals by £209—making together an increase on the two accounts of £653. The coal strike in the autumn of last year cost the Company about £170; but the contracts for the year were at a lower rate than those of the previous year—thus bringing the average cost of raw material to about the same. The total receipts amounted to £4735; and the expenditure (including £634 for bankers' charges and interest on debentures) was £4114, leaving a profit of £621. During the year the Directors took over from the Manager (Mr. J. T. Lewis, of Wellingborough), who previously carried it on on his own private account, the fitting department of the concern, on which a profit of £64 was made—a very satisfactory addition to the business. Mr. Lewis has lately recovered from a serious illness; and the Directors closed their report by offering to Mrs. Lewis and the family their own and the shareholders' congratulations. The report was adopted; and a dividend of 5 per cent., free of income-tax, was declared. A resolution was passed increasing the number of Directors to twelve, and appointing Mr. Lewis one of them.

Improvements at the Birkenhead Water-Works.—A Special Sub-Committee of the Birkenhead Gas and Water Committee appointed to consider the subject of the water supply of the borough have issued a report, in which they state that it is proposed to carry out certain works at Springhill, at a cost of £4350, which will probably give an increased supply of 4¼ million gallons per week. With regard to the question of proceeding with proposed new works at the Ford, a trial bore-hole was made in 1884 on land purchased by the Corporation as the site of a new pumping-station; and the nature of the strata at that point was then ascertained. The Engineer now suggests that a bore-hole should be put down a depth of 500 feet, and that a horizontal engine and pumps should be hired in order to test the yield of water; and if the results are satisfactory, a line of mains could then be laid from the bore-hole to the Flaybrick Hill reservoir, if the water should be immediately required. The Sub-Committee recommend that this work be done at an estimated cost of £2600, which will be provided out of moneys authorized to be borrowed under the Birkenhead Corporation Gas and Water Act, 1881.

GAS PROVISIONAL ORDERS FOR THE PRESENT SESSION.

The Board of Trade have issued Memorandums stating the nature of the proposals contained in the Provisional Orders included in the two Gas Orders Confirmation Bills now before Parliament.

The first Bill comprises the Orders relating to Bolsover, Earby and Thornton, Ilford, and Willenhall. The Bolsover Order is to empower the Bolsover Gaslight and Coke Company, Limited, to construct and maintain gas-works, and manufacture and supply gas in the parish of Bolsover, in the county of Derby, and to sell gas in bulk, by agreement, beyond the limits of supply. The capital is to be fixed at £5000 by shares and £1250 by loan; and the standard price to be charged for gas is 5s. 3d. per 1000 cubic feet, with sliding-scale as to price and dividend. The Earby and Thornton Order is to authorize the Earby and Thornton Gas and Lighting Company, Limited, to maintain and continue gas-works, and manufacture and supply gas in the parish of Thornton-in-Craven, in the West Riding of the county of York. The capital is to be £10,000 by shares and £2500 by loan; and the maximum price to be charged for gas, 5s. per 1000 cubic feet, with power to the Board of Trade, after three years, to alter the maximum, or to fix a standard price, with sliding-scale as to price and dividend. The Ilford Gas Order is to confer upon the Ilford Gaslight and Coke Company, Limited, power to raise additional capital, not exceeding £34,000 by shares and £8500 by loan; to purchase lands; to construct and maintain additional works; and to sell gas in bulk, by agreement, beyond the limits of supply. The standard price to be charged for gas is to be 6d. per 1000 cubic feet, with sliding-scale as to price and dividend. The Willenhall Gas Order is to permit the Willenhall Gas Company to raise additional capital, not exceeding £18,000 by shares and £4500 by loan.

The second Bill comprises the Orders relating to Newquay, North Bierley, Uttoxeter, and Worthing. The Newquay Gas Order is to empower the Newquay Gas Company, Limited, to maintain and continue gas-works, and manufacture and supply gas in the parishes of St. Colomb Minor and Crantock, in the county of Cornwall, and to sell gas in bulk, by agreement, beyond the limits of supply. The capital is to be £12,500 by shares, and £3125 by loan; and the maximum price to be charged for gas, 6s. per 1000 cubic feet, with power to the Board of Trade, after the expiration of five years, to alter the maximum, or to fix a standard price, with sliding-scale as to price and dividend. The North Bierley Gas Order is to give authority to the North Bierley Gas Company to borrow on mortgage, in respect of their existing capital, any sums not exceeding in the whole £9375; and to fix the maximum price to be charged for gas at 4s. per 1000 cubic feet, with power to the Board of Trade, after the expiration of three years, to alter the maximum, or to fix a standard price, with sliding-scale as to price and dividend. The Uttoxeter Gas Order is to empower the Uttoxeter Gas-Works, Limited, to maintain and continue gas-works, and manufacture and supply gas in the parish of Uttoxeter, in the county of Stafford; also to sell gas in bulk, by agreement, beyond the limits of supply. The capital is to be fixed at £10,000 by shares and £2500 by loan; and the standard price to be charged for gas, at 3s. 2d. per 1000 cubic feet, with sliding-scale as to price and dividend. The Worthing Gas Order is to authorize the Worthing Gaslight and Coke Company to raise additional capital not exceeding £32,000 by shares, and to borrow on mortgage in respect thereof not exceeding £8000; also to construct and maintain additional works, and to supply gas in bulk, by agreement, beyond the limits. The standard price to be charged for gas is to be 4s. 3d. per 1000 cubic feet, with sliding-scale as to price and dividend; the dividend not to be increased above the standard rates unless the price charged is 1d. or more below 3s. 9d. per 1000 cubic feet.

CHELSEA WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices, Commercial Road, Pimlico, last Thursday—Sir W. H. Wyatt in the chair.

The Secretary (Mr. G. H. Gill) read the notice calling the meeting; and the report of the Directors was taken as read. It stated, *inter alia*, that the gross income for the half year to March 31 last had been £74,142; and the working expenses, £22,611.

The Governor, in moving the adoption of the report, apologized for the lateness in forwarding to the proprietors the report and accounts on the present occasion. There was some difference between the Directors and the Government Auditor as to the form of the accounts, although not as to their substance; and they could not get Mr. Stoneham's signature in time to issue the report and accounts sooner. The income was satisfactory; and the working expenses amounted to very little more than 30 per cent. of the income. As long as they saw that, they might be sure that things were going on satisfactorily. They had expended a good deal of money on capital account in the half year—£9038. Of this sum, £7000 had been paid to the contractors on account of providing and laying the new trunk mains between Stamford Bridge, Fulham, and the reservoirs on Putney Heath; and £1335 had been expended on a connection between the Company's trunk mains and those of the Grand Junction Company at Hyde Park Corner. In the event, therefore, of any difficulty occurring anywhere in their system, they could fall back on the help of the Grand Junction Company. They would probably never want to do so; but they would now be in a position to do so, should it become absolutely necessary. They had of late very largely increased the quantity of water pumped, owing chiefly, though not entirely, to the constant supply. Whether they would ever get the quantity down or not, he could not say. Their Chief Engineer thought that they might do so; but great waste took place soon after the constant supply was given. This was a very serious matter for their own and the other Companies. He was glad to inform them that the Engineer reported that the whole of the works, plant, buildings, machinery, meters, &c., had been maintained in an efficient state of repair during the half year. As he had said before, they kept gradually increasing the constant supply, as they were obliged to do on the requisition of the London County Council; and at the present time about 52 per cent. of their supplies were given on this system. With regard to the very important question of the proposed storeage reservoirs at Staines, as recommended by the Royal Commission, they would be glad to see the scheme carried out to a reasonable extent; and some of the Companies were in communication on the subject. Some of them, however, would not have anything to do with the matter; but he was not without hope that a minor plan—although something which would be satisfactory to the Royal Commission—would come of it. They had got the refusal of the land the acquisition of which was contemplated, up to September, 1895, on payment of a moderate fine, which would be lost if they did not go on. This, he thought, showed that they were in earnest in the matter, and that they hoped to go through with it. The proprietors would have seen in the report that a communication was received from the London County Council last March, inquiring whether the Directors would be willing to enter into negotiations for the sale of their undertaking. They saw at once that this was not a genuine proposal. They wanted the Directors to enter into negotiations, in order to entrap them into stating the amount they would be willing to take, so that advantage might be taken of the information afterwards. The Directors, however, were too old to be trapped this way; and, in reply, they informed the Council that, though they would be averse to the transfer of their undertaking, they would give most careful consideration to any direct proposal which the Council might make. The Council kept on worrying them; and as they had been defeated this year in Parliament in all their objects, more or less, the Council were very angry. The Thames Conservators had introduced into Parliament a Bill which would have involved the Company in a further heavy payment—in short, they wanted the Company to pay them £2000 extra per annum, without giving them any more water, and, indeed, without doing them any good in return. They had succeeded in getting this amount reduced to £1200, which was a boon; and they had also got many of the objectionable clauses in the Bill altered, so that they would not be interfered with so much as had been at first proposed in the measure. Whether or not they would get through Parliament, he could not say. The London County Council stated that they intended to oppose them on the third reading; and there was some doubt, therefore, whether they would get through. Probably it would be better if they did, because one did not know what the County Council might bring forward next year. They were in such an advantageous position in being able to finger other people's money; and they did not seem to care what they expended. The amount paid for law expenses was very small in the present accounts; but they would not be very light next time, for they had been 28 days before a Committee of the House of Commons. The expenditure thus imposed upon them was shared with the other Companies; but nevertheless their own portion would amount to a very substantial sum. In consequence of the large expenditure which they had had to incur, they had been obliged to raise fresh money. They had overdrawn the capital account to the extent of £16,100; and therefore they had issued a certain portion of the debenture stock remaining unissued. In order to make the money go as far as they possibly could, they offered it to the proprietors at a premium of 35 per cent. They had issued £25,890 of the stock, which would bring in £34,000 or £35,000; and this would carry them on for some time to come, unless they decided on some extraordinary outlay. An action for damages was brought against them four or five years ago, but was never prosecuted until lately, for the serious burst which occurred in January, 1889, on one of their trunk mains on Putney Hill. The matter had resulted very satisfactorily to them in most respects, because, in the first instance, the jury found that the Company had been guilty of no neglect of any kind. This decision, however, was appealed against on a point of law—as to misdirection, or some such thing—but the appeal was dismissed with costs, so that they gained the day once more. The unfortunate feature in connection with the matter was that, although they had been successful, he did not suppose they would get a shilling of costs; the plaintiff having in the meantime assigned everything to his creditors. At the same time, it was a most satisfactory decision to have obtained from the Court of Appeal—that if one had statutory powers, one was not responsible unless there was neglect. Not only was this a satisfactory and very valuable point for them, but also for the other Companies.

The Deputy-Governor (Mr. F. S. Clayton) seconded the motion, which was unanimously adopted. Resolutions were afterwards passed, approving the payment of the dividends on the preference stocks, and of a dividend for the half year at the rate of 10 per cent. per annum, less income-tax, on the ordinary capital stock; and re-electing the retiring Directors (Messrs. W. H. Yatman, W. P. Bodkin, J. Hunt, and Albert Gill) and the retiring Auditor (Mr. G. F. Aston).

On the motion of Mr. J. B. Doe, seconded by Mr. H. P. Bodkin, a vote of thanks was passed to the Governor and Directors, for their able administration of the Company's affairs.

The Governor briefly returned thanks; and the proceedings then terminated.

Water-Works Extensions at Southampton.—The Southampton County Council have accepted a tender, submitted by Mr. H. W. Bull, and amounting to £3093, for the building of an engine-house in connection with the Otterbourne water-works.

Sales of Shares.—Messrs. Bray and Co. sold at Hastings, last Tuesday, 14 £20 shares in the *Hastings and St. Leonards Gas Company* at £40 10s.; and one, at £40 7s. 6d. Three £100 debenture shares were sold at £101 each.——Last Tuesday, Mr. Alfred Richards conducted at the Mart, Tokenhouse Yard, E.C., a very successful sale of between £7000 and £8000 of 4 per cent. perpetual debenture stock of the *Southend Gas Company*. It was offered in lots of £50 and £100; and it was sold at prices ranging from £110 down to £105 per £100 stock—the average being £106 1s. The total amount realized by the sale was £7954 15s.——The 500 ordinary 7 per cent. shares (£10) in the *Bromley Gas Company*, which, as intimated in our advertisement columns a few weeks ago, were to be offered for sale on the 20th inst., were all disposed of at the following prices: 445 at £16 12s. 6d., 10 at £16 15s., 25 at £16 17s. 6d., and 20 at £17 each. The total amount realized by the sale was £8327 10s.

PROVINCIAL WATER COMPANIES ASSOCIATION.

Complimentary Dinner to Sir Theodore Fry, Bart.

The members of the above-named Association entertained their Chairman (Sir Theodore Fry, Bart., M.P.) at a complimentary dinner at the Hotel Victoria, Northumberland Avenue, last Wednesday, for the purpose of congratulating him on his elevation to a baronetcy, and as an expression of their appreciation of the able services rendered by him to the Association. Representatives from a large number of provincial water companies were present—many having travelled long distances to do honour to Sir Theodore. The chair was taken by Mr. Frank James, J.P., the Chairman of the South Staffordshire Water Company. After dinner, the usual loyal toasts having been disposed of, the Chairman proposed—"The Guest of the Evening." In doing so, he congratulated Sir Theodore Fry upon the honour conferred upon him by Her Majesty, and expressed the hope that he might live long to enjoy it and continue his valuable services to the Association. He pointed out the benefits to the provincial companies of having "a man on the spot," to give warning and protect their interests in cases which might otherwise escape attention; and thus result in litigation adverse to them. The toast having been drunk with great enthusiasm, Sir Theodore replied, and referred to the matters which brought about the formation of the Association in the year 1885, at the instance of the Deputy-Chairman (Mr. A. Alexander, of Bristol), who had ever since continued to be a most active member of the Committee. He said he would do his best to continue to serve the Association. Mr. Alderman Rymer, J.P., of York, next proposed—"Success to the Association;" calling attention to the great benefits which resulted to the Companies belonging to it. The Deputy-Chairman, in his reply, dwelt on the various matters which had from time to time engaged the attention of the Committee—something like 40 Bills, all more or less prejudicially affecting the interests of water companies, having come under their consideration. He said he felt that the Association—formed, as it was, for the sole purpose of defence—ought to receive the active support of all the water companies in the kingdom. Mr. C. Thomas, Deputy-Chairman of the Midland Railway, and one of the Directors of the Bristol Water Company, proposed, and Mr. F. J. Fry (brother of Sir Theodore) responded for, "The Visitors." Mr. E. P. Youell, the Chairman of the Great Yarmouth Water Company, next proposed the health of the Chairman of the evening, to which Mr. James suitably replied. Mr. Chamberlin, a Director of the Norwich and Lowestoft Water Companies, proposed the health of Mr. Charles Hawksley, and referred in sympathetic terms to the great loss water-works in general had sustained by the death of his father, the late Mr. Thomas Hawksley, who had been a member of the Association from its foundation. Mr. Hawksley replied; and pointed out that he shared the views his father had so frequently expressed—viz., that the community was more likely to be better served when the water supply was provided by private enterprise, with the local authority acting as the watch-dog, ready to bark if the company failed in their duty to the consumers—than when such supply was in the hands of the municipality. The Chairman next proposed the health of the Secretary (Mr. R. L. S. Badham), and spoke in high terms of his unceasing watchfulness over the interests of the Association. He said he did not think it would be possible to introduce into Parliament any Bill containing provisions affecting water companies which would escape the eyes of the Secretary. Mr. Badham, in reply, heartily thanked the Chairman for the too flattering terms in which he had referred to his services, and to the gentlemen present for the very kind way in which they had received the toast. Though it gave him very great pleasure to have the honour of addressing so many distinguished members of the Association, he hoped he would not be misunderstood when he said he should have preferred to have an opportunity of making a few remarks to representatives of water companies who were not members. He had now had some years' experience as their Secretary; and he not only stated, but was prepared to prove to anyone who had doubts on the subject, that the work of the Association as regard Public Bills was of substantial value to all water companies. He might also be permitted to point out that, of late, when that, to his mind, most objectionable practice of opposing Private Bills on second reading, and endeavouring to hamper Select Committees with all sorts of "instructions," had become so common, the Association had on many occasions been of very great assistance to its members; and he trusted that he might live to see the day when the name of every water company in Great Britain was entered in their list of members, for the purpose of mutually defending their common interests. The company separated after a most enjoyable evening; and it was suggested in more than one quarter that a dinner, as well as the general meeting, should take place annually.

METROPOLIS WATER SUPPLY.

The Quality of the Water during the Month of May.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the past month, show that the average daily supply was 196,123,630 gallons, as compared with 207,617,049 gallons in the corresponding month of 1893. The number of services being 805,200, the rate was 244 gallons to each service. Of the entire bulk of water sent out, 100,426,906 gallons were drawn from the Thames, and 95,696,724 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: Taking the average amount of organic impurity in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health, was: Kent, 0·5; East London (deep well), 0·8; New River, 1; Tottenham, 1·4; Chelsea and Colne Valley, 1·8; East London (river supply), 2·4; West Middlesex, 2·7; Southwark and Lambeth, 2·9; and Grand Junction, 3·2; The unfiltered river water contained the following proportions: Thames at Hampton, 4·9; New River Cut, 2·2; and the Lea at the East London Company's intake, 4·1. The Thames at Hampton was turbid and yellow in colour on the 3rd of May. It was, both chemically and bacterially, of fairly good quality. As delivered by the five Companies drawing from this river, it was of excellent quality; ranking, in the case of the Chelsea, with the deep-well waters in respect of organic purity. It was in every case efficiently filtered, and exhibited the following percentage bacterial improvement: Chelsea, 99·79; West Middlesex, 99·1; Southwark (average of two filters), 99·2; Grand Junction (average of three filters), 97·67; and Lambeth, 99·51. The New River Cut was turbid and pale yellow on the 2nd of May; but otherwise it was of very good chemical quality. After passing through the subsidence reservoirs, it was also, for unfiltered water, of excellent bacterial quality. It was efficiently filtered before delivery, and was improved bacterially, on an average, 98·42 per cent. In respect of organic purity, it ranked with the deep-well waters. The raw river water of the Lea, at Angel Road, was turbid and pale yellow in colour on the 1st of May. It was chemically of slightly better quality than, but bacterially much inferior to, the Thames at Hampton. It was efficiently filtered before delivery, and much improved in chemical quality, while 99·18 per cent., on an average, of the microbes were removed by storeage and filtration. The deep-well waters of the Kent, Colne Valley, and East London Companies, and of the Tottenham Local Board of Health, were of excellent quality for dietetic purposes. The Tottenham and the East London Company's supplies, however, were slightly turbid. The rest of the waters were clear and bright without filtration; and the Colne Valley Company's water was softened before delivery, and thus rendered suitable for washing. The Kent Company's water was again distinguished for its high degree of organic purity. Seen through a stratum 2 feet deep, the Kent and Colne Valley waters were clear and colourless; the Tottenham and East London well waters, slightly turbid and colourless; the New River water, clear and nearly colourless; and the remaining waters, clear and very pale yellow. The bacterioscopic examination of the raw river waters, and of those supplied by the Companies, collected on May 1 to 4, gave the results contained in the following table:—

Description.	No. of Microbes per Cubic Centimetre.	Temperature in Deg. C.
Raw and Stored River Waters.		
Thames at Hampton	2880	12·5
„ after storeage for 13 days (Chelsea Coy.)	2040	12·5
Gravel water (Southwark Company)	120	10·7
Water filtered through artificially laid gravel (Grand Junction Company)	180	12·5
New River Cut, after passing through reservoirs	380	12·2
Lea at Angel Road	4280	12·0
„ after storeage for 15 days	300	12·3
Thames.		
Chelsea	6	12·4
West Middlesex	26	12·0
Southwark, No. 4 well, Hampton	16	11·5
„ „ 8 „ „	30	12·1
Grand Junction (Hampton general well)	40	12·5
„ (Kew general well)	74	12·3
„ (Kew south well)	20	12·4
Lambeth	14	12·4
Lea.		
New River, main well	8	12·3
„ No. 1 filter	4	11·8
East London, No. 1 Essex well	22	11·8
„ No. 2 „	4	12·1
„ Middlesex well	68	11·4
„ No. 11 bed	38	11·6
„ No. 12 „	42	11·7
Deep Well.		
Kent, new well	50	11·3

In the course of their report for the past month to the Official Water Examiner (Major-General A. de Courcy Scott, R.E.), Messrs. Crookes and Odling say: Of the 182 samples examined, two were recorded as "clear but dull;" the remainder being clear, bright, and well filtered. Again we have to record a deficient rainfall in the valley of the Thames. During the month of May, there fell 1·45 inches of rain; whereas the mean fall during 25 years for the same month is 1·95 inches—thus showing a deficiency of exactly 0·5 inch. Since the winter, there has been a steady improvement in the chemical quality of the water supplied by the Companies deriving their supply from the Thames. Last month we showed, in a tabular form, the improvement noticeable in April. The following is a repetition of that table, with the addition of the figures for the month of May:—

Averages of the Five Supplies derived from the River Thames.

	Common Salt per Gallon.	Nitric Acid per Gallon.	Hardness, in Degrees.	Oxygen required per Gall.	Organic Carbon per Gall.	Organic Carbon per Gall.
March	2·285	1·101	15·32	0·052	0·121	0·162
April	2·100	0·995	15·00	0·034	0·076	0·108
May	2 035	0 839	14·14	0 033	0·073	0 102

Note.—All the figures are means except those in the last column, which are maxima

Colour.—March, 21·3 brown to 20 blue; April, 14·2 brown to 20 blue; May, 14·6 brown to 20 blue.

The differences are slight; but they point to improvement, and show that the filtering and other purifying appliances of the Companies are in efficient order. It will be remembered that the May of last year was a very dry month; and in other respects the meteorological conditions were such as to conduce to a high purity of the river. The waters for the month just passed, while not quite reaching the same figures that were attained twelve months ago, are so nearly the same that, for all practical purposes, they may be considered to show the same degree of purity; the organic carbon being only 0·011 grain higher, while the oxygen required for the oxidation of the organic matter is only 0·004 grain per gallon higher.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Everyone is congratulating Mr. R. Mitchell, the Engineer of the Edinburgh and Leith Corporation Gas-Works upon his election to the post of President of the Incorporated Gas Institute. Mr. Mitchell is the essence of geniality. He has, moreover, a square head upon his shoulders, in which there is a great capacity for the storeage of the most stubborn facts; and his readiness at laying these facts before his hearers is well known and acknowledged. He is likely to make a useful and popular President.

This week has brought out the annual abstract of accounts of the Edinburgh and Leith Gas Commission; and a very satisfactory document it is. The accounts of a large undertaking like this are so complex that comparisons are difficult to make. Of course, as they are prepared by Mr. Gibb, they are simplicity itself; what I refer to is the variation in the conditions from year to year. Thus, it is but two years since gas was selling at 4s. 6d. per 1000 cubic feet; and it is now at 3s. 8d.—a drop of 10d. The effect of the high price, which had been advanced from 3s. 9d., was to check the increase in the consumption of gas; and it fell by 27 million cubic feet. In 1892-3, the Commissioners reduced the price by 8d.; and the consumption rose by nearly 11 million cubic feet. Last September they further reduced it by 2d.; and this year again there is an increase of nearly 39 million cubic feet. The effect upon the accounts in those years was that the income from gas supplied was as follows: 1891-92, £270,917; 1892-93, £245,036; and last year, £224,982. These variations are largely the result of the price of coal, which in those years cost the Commissioners respectively £125,267, £112,808, and £87,737. These varying quantities make it the work of an accountant to find out how the business is progressing. There is, however, one quantity which is sufficiently fixed to be capable of understanding. That is the consumption of gas. This was 1,271,143,000 cubic feet; and, as stated, is nearly 39 million feet more than in the preceding year. In 1889-90, which was the first entire year of the Gas Commission, the consumption was 1,104,514,600 cubic feet; so that in five years there has been an increase of 166,628,400 cubic feet, or an average annual increase of 33⅓ million cubic feet. This shows a satisfactory progressive business. Another feature of the accounts, to which I called attention last year, is again prominent; and that is the yield of gas per ton. In the year 1891-92, the gas consumed was 1221 million feet, derived from 135,219 tons of coal; in 1892-93 it was 1232 millions, from 132,038 tons; and last year it was 1271 millions, from 131,980 tons. There is no doubt the increased yield is accountable to a great degree for this state of matters. Decrease in leakage will also explain a good deal of it; and in this connection, it may be said that now the Engineers have completed the districting of the area of supply, and there being less tampering with the mains, the leakage is bound to go down. The net balance for the past year amounts to £19,641. Last year it was only £2488; but in the year preceding that it was £27,180. The Commissioners have taken to carrying forward their balances. They are likely to do the same this time; and if they do, they will have the handsome sum of £49,309 in hand. They seem at present to favour the policy of redeeming annuities. As a beginning, they some time ago purchased £200 of annuities, paying £6015 for the amount. They have in hand £41,249 which is applicable to the same purpose, with which they could wipe out other £700 of annuities. Of course, they cannot compel the holders of annuities to sell; they can only purchase when the stock comes into the market, which is seldom. At the end of 14 years from now, they will be in a position to call up whatever annuities they like; paying for them at the rate of 28½ years' purchase. That is one purpose to which the money in hand might be applied; but there are others—as, for instance, the new works at Leith, which will require a large sum. There is also the lowering of the price of gas. That will not likely be considered till autumn; and it will not depend upon past savings so much as upon current working. When the rise in the price of coal is taken into account, it is improbable there will be any reduction in the price of gas. The accounts, as usual, are issued subject to audit; and they do not come before the Commissioners till the end of July.

The Dundee Gas Commissioners held their annual meeting on Wednesday. Mr. J. Mitchell, the Convener of the Finance Committee, in his statement, explanatory of the accounts, brought out some interesting particulars. He, of course, dealt with the exceptional dulness which characterized the staple trade of the city—jute-spinning—and how it had affected the Commission by leading to a decreased consumption of gas to the amount of 24 million cubic feet. Unaccounted-for gas was only 8·143 per cent. of their total make. This is the lowest on record in Dundee; and it is a very good one, seeing it was 24 per cent. when the Commission was formed. The decreased consumption of gas led to about 5000 tons of coal less being carbonized; and there was thus a saving in outlay of £3898. The yield of gas per ton was estimated at 10,000 feet, but it had turned out to be 10,484 feet. During the year they redeemed £19 of annuities, at a cost of £597. They have now redeemed in all £1306 of annuities, at a cost of £35,650. There are yet £7356 of annuities to redeem; and at their present price of 33 years' purchase, the sum required to extinguish them would be £242,748. They have been able to contract for coal at the same price as last year—12s. 2½d. per ton—which is a very favourable circumstance for them, as the general experience this year is an increase in the price. The deficit on the electric department, amounting to £1721, has been wiped off out of gas revenue. Mr. Mitchell thought it a wise course to so deal with the amount, instead of carrying it forward—more especially as it could be done without increasing the price of gas, regarding which opinion there is room for difference. The extent of the electric lighting department is 186 customers, with 5293 lamps of 16-candle power. The price of gas has been continued at 3s. 4d. per 1000 cubic feet. This, as Lord Provost Low reminded them, was the last annual meeting of the Commission, whose duties are to be transferred to the Town Council in a few months. He regretted that they had not, during the quarter of a century they had managed the gas undertaking, been able to pay more into the sinking fund; but, on the other hand, he thought the community could not complain, as they had had the advantage of cheaper gas. On his Lordship's motion, Mr. Mitchell was thanked for his services as Convener of the Finance Committee during the past 13 years.

The coal strike begins next week. It is now all but certain that there will be a strike of considerable dimensions; but the general expectation is that it will be short. Fortunately for residents in cities and towns, and also for gas managers, it occurs when the demand for coal is small. On the other hand, it is an inopportune time for the financiers of gas-works, who are about to purchase coal for the year. The effect of its coming just now will be that contracts will be held off until it is over; and then, if the men lose, as is the general expectation of nearly everyone outside their own ranks, prices may be easier. Coal will, at any rate, be plentiful after the strike, on account of the number of contracts which will have gone to England. What is perhaps of most concern to gas managers is the anticipation that the struggle will be worst in Fifeshire and the Lothians, from which a great quantity of gas coal is got. The reason given for this expectation is that in those districts the miners are nearly all Scotchmen, and that, judging by former experiences, when they do come out they are not easily got in again. In the West there are many Irishmen and Germans in the pits; and they are looked upon as being easier to handle. At present the masters are standing firm, and declining conciliation; while the men's leaders, just on the eve of coming out, have announced that they are prepared to meet in conference. This is a stroke of policy which may bring the men sympathy; but its effect on the masters will be *nil*. They are determined to have it out, now that the men have entered upon warfare. There is much discontent at the 6d. levy in England; and unless it be increased, it is likely to be the most important factor in bringing the strike to a close.

The Dunbar Gas Commissioners have closed their financial year with a credit balance of £84, which they have agreed to carry forward. Last year they reported a balance of £47 which they likewise carried forward. During the past year, their income from the sale of gas was £1369. Their coal account amounted to £730; interest costs them £262; and they were only able to write off £180 for depreciation of plant, though the debt on the works is as high as £6762. This is not a very sound position.

The Rothesay Police Commissioners have contracted for 4400 tons of coal, at an average price of 13s. 7d. per ton, as compared with 12s. 10d. last year. The increased price is estimated to entail an additional expenditure of £165. It is also estimated that lime will cost them £13 more this year. On the other hand, residual products are estimated to produce £170 more than last year, and about £30 less will be paid for carting; so that the saving will be £200, as against £178 of increase. A good illustration of the difficulty of running with the hare and hunting with the hounds was given at the last meeting of the Commissioners. A year ago there was, it appears, a complaint that outside dealers had been asked to offer for the lime contract; the opinion being expressed, which is so common now, that local people should get the preference. On account of this incident, the Gas Committee this year confined themselves to local offers; and for doing so there was again a grumble. The reason for this was that, as the Town Clerk said, the price had gone up 1s. 2d. per ton. Just so; if democratic notions are to prevail to the extent of limiting the market for commodities to local people, it is only what might be expected that more would have to be paid. The singular thing is that there were only two local offerers; and as their price was the same, the contract was divided between them. The contract for the freightage of coal gave rise to much the same discussion, because in connection with it local offers only were asked, and just on the eve of the meeting tenders came in from two outsiders, one of which was about £60 lower than the Committee had agreed to accept. There was some uneasiness at the loss of this money; but it was recognized that the offers came in too late to be accepted.

There were upwards of 40 applicants for the post of Manager of the Kelso Gas Company's works, which was vacant by the transference of Mr. Frank Scott to Galashiels, to assist his father in the management there. The list of applicants included many practical men; but the choice of the Directors seems to have fallen on one who, if he has any practical knowledge of gas making, must have acquired it long ago. The successful gentleman was Mr. David Wallace, who, it is announced, has been a long and valued servant with Messrs. A. Dunn and Sons, of Kelso. Messrs. Dunn and Sons are millers and grain merchants. Of course, the Directors know the interests of the Company; and they may in reality have appointed the very best man who applied. All the same, there will be disappointment among those who have been unsuccessful that a man who was not actively engaged in a gas-works should have been appointed.

The Meigle Gas Company have paid a dividend at the rate of 2½ per cent. for the past year. A letter was submitted to the Directors last week from a firm of gas engineers offering to fit up oil-gas plant in the works for £140. It was resolved, in view of the limited number of consumers, that it would be unwise to incur the expenditure.

New Joint-Stock Companies.—The following Companies have just been registered: Loanda Gas Company, Limited, with a capital of £50,000, in £10 shares, to acquire a concession granted for the public and private lighting of the city of Loanda, in South-West Africa, by means of gas, electricity, or any other system, for 50 years; and to manufacture and supply gas, electricity, motors, generators, and other appliances. Dawson Gas-Engines Syndicate, Limited, with a capital of £70,000, in £10 shares, to acquire patent rights, &c., the property of H. J. Dawson, and to manufacture and deal in gas-engines.

The Profits of the Stoke Corporation Gas-Works.—The minutes submitted by the Executive Gas Committee at the meeting of the Stoke Town Council last Thursday recommended that the accounts for the year ending March 31 last should be adopted, subject to audit, and also that a further remittance of £1000 should be made to the Town Council on account of the current year's profits. The Mayor (Alderman Faram) intimated that this was the second £1000 which had been handed over by the Committee to the Council this year. He thought they had reason to be well satisfied with the way in which things were going on. The recommendation was adopted.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June* 23.

Sulphate of Ammonia.—The market has been very quiet; and the business is confined entirely to purchases by dealers, to supply their requirements for June. Consumers just before the close of the half year usually abstain; and at present they are advised that they will reap a benefit by keeping out of the market for some time, in the probable lowering of values in consequence. The depression at the moment is clearly artificial, as there is not only very little offering from first and second hands, but the production is almost at its minimum, and even a small demand would keep prices in balance. That there will be many requirements during the next few months cannot be denied; and when a large number of buyers are on the *qui vive*, there is always a danger of a rush, when supplies are likely to be unequal to the demand. A strike in Scotland may aggravate matters. There are to-day sellers at £13 17s. 6d. at the ports. Nitrate is steady, at 9s. 4½d. to 9s. 6d.

LONDON, *June* 23.

Tar Products.—The improvement in the value of pitch continues; and a sale is reported at 32s. f.o.b. Thames. It is difficult to see how fuel makers can pay this price, with best screened coal offering so low as it is. For country ports, where freights are less favourable, 2s. or 3s. per ton less only can be obtained. Solvent naphtha is in good request, at firm rates; while benzol lags, and is difficult to sell at the prices named below. There is a slightly better feeling in creosote and other oils. Carbolic acid and disinfectants are in demand at former prices. Values are as follows: Tar, 13s. 6d. to 18s. 6d. Pitch, 29s. to 32s., according to port. Benzol, 90's, 1s.; 50's, 1s. 3d. Solvent naphtha, 1s. 4d. Creosote, 1¾d. Creosote salts, 20s. Toluol, 1s. 6d. Cresylic acid, 11d. Crude benzol naphtha, 30 per cent., 5d. Carbolic acid, 60's, 1s. 8d. Anthracene, "A," 1s. 2d.; "B," 10½d.

Sulphate of Ammonia has shown considerable weakness during the week, and buyers have held aloof; but to-day there is more firmness. There are buyers at £14 per ton, less 3½ per cent. Gas liquor is quoted at 11s. to 13s. per ton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The position generally throughout the coal trade of this district undergoes no material change; but the tendency of prices continues downwards. The only direction in which it may be said that Lancashire colliery owners are in any better position is in the shipping trade, where considerably more orders have during the past week or so been coming forward, owing to the impending strike of Scotch miners. This has made some of the collieries which do a shipping business fairly busy; and slightly better prices have been obtained. At the commencement of the month the Lancashire Coal Sales Association reduced the official quotations for shipment 6d. per ton, bringing them to 8s. and 8s. 6d. for steam coal delivered at the ports on the Mersey; but 8s. 6d. to 8s. 9d. has been readily got, and in special cases as much as 9s. Of course, this may be only temporary; but for the time being it is enabling Lancashire coalowners to get rid of coal for shipment which would otherwise remain on their hands. As far as the inland trade is concerned, a very depressed tone prevails generally; and with regard to gas coals, the settlement of the contract for the supply of the Manchester Corporation (referred to last week) fully bears out what I have previously indicated would be the probable course of prices. So far, nothing really definite has transpired as to the actual prices at which the contracts have been placed; but the quantity secured by Lancashire coalowners is less than usual. I know, for a fact, that one or two firms who held out to the understood arrangement that they should quote on the basis of an advance of 6d. over last season's prices have this year been unsuccessful in securing any portion of the contracts; but one tender for 10,000 tons by a Wigan firm was accepted, I understand, at rather better prices than were ruling last year. With regard to the round coal trade generally, although the Lancashire Coal Sales Association, at the usual fortnightly meeting, decided that no change should be made on previous list rates, the tone is easier; and the special prices which one or two collieries were previously quoting have now disappeared. Best Wigan Arley does not average more than 11s. to 11s. 6d.; Pemberton four-feet and seconds Arley, 10s. to 10s. 6d.; with the lower qualities of round coal ranging from 6s. 9d. and 7s. 3d. for steam and forge coals, to 7s. 6d. to 8s. 6d. for the better qualities. Engine classes of fuel are more plentiful in the market, some of the Wigan collieries having large stocks on hand; and common qualities of slack are readily obtainable at 4s. 3d. to 4s. 6d. per ton at the pit, with the better sorts averaging from 5s. 6d. to 6s.

Northern Coal Trade.—Owing to the approach of the expected strike in the Scotch coal trade, there has been a fuller demand for coal in the North-east of England. Prices of some kinds have advanced; but it is an advance that is on a very small portion of the coal produced. Much more important is the fact that the coal has been better taken up, and that more collieries have wrought fuller time, especially steam coal pits. Best Northumbrian steam coal has been generally put up to 11s. per ton f.o.b.; and one sale at 11s. 6d. per ton has actually taken place. Second-class steam coal is correspondingly dearer; and steam smalls may now be quoted at from 4s. 9d. to 5s. 6d. per ton. In gas coals, the alterations are fewer. One or two contracts, local and for export, have been allotted; but they are merely the renewals of annual supplies, though at advanced prices—the advance being about 1s. per ton in most cases. Some of the collieries in the combination seem now to be chafing a little at the success of outside collieries with some of the contracts; but the quantities concerned are not so very material. There is no alteration in the prices for odd cargoes; but a little stiffening of rates may be recorded. From 7s. to 7s. 9d. per ton f.o.b. may be looked on as the current quotations. Coke is steadier at from 13s. 6d. to 14s. 6d. per ton f.o.b.; and the shipments from the Tyne and from West Hartlepool are at last larger. The local demand is good. For gas coke, there is a fair inquiry; and with a limited production, stocks are small and the price is steadily maintained.

Scotch Coal Trade.—On the eve of the strike which will have begun before this is published, it is a necessity that there should be great disorganization in the Scotch coal trade. Prices cannot be condescended upon, because there is little coal in the open market; contractors being ready to take up all they can get, while coalowners are anxious to keep all they can for the bing. Shipments, as might be expected, show a decrease. For the week, they amounted to 162,142 tons—a decrease of 1115 tons upon the previous week, and of 1223 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,364,625 tons—an increase as compared with the same period of last year of 359,968 tons.

Gas and Electric Lighting Affairs at Coventry.—The Gas Committee reported to the Coventry City Council last Tuesday that they had purchased, at a sale by auction, additional property, for the purposes of the gas undertaking, at a cost of £1100; and they asked the Council to ratify their action. This raised a discussion on the old question as to the advisability of extending the works on the present site; and one of the members asked the Committee to furnish an estimate for auxiliary works outside the city. Mr. Andrews, the Chairman of the Committee, said this was done some years ago; and, as far as his recollection went, the estimate was about £100,000, including the large trunk mains which would be necessary. He thought it would be sheer folly on the part of the ratepayers, when they were going to have the electric light, to extend the gas-works. After they had the electric light, they would be in a better position to judge of the desirability of new gas-works beyond the city. The report was adopted. In the course of the proceedings, it was announced by the Town Clerk that the Local Government Board had sanctioned the borrowing of £20,000 for electric lighting purposes; and the Council, on the recommendation of the Electric Light Committee, accepted the tender of Mr. C. G. Hill, of Coventry, for the erection of the buildings required, at a cost of £6829.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 1231.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	**GAS COMPANIES.**				£ s. d.
590,000	10	12 Apl.	10½	Alliance & Dublin 10 p. c.	10	17½–18½	..	5 13 6
100,000	10	,,	7½	Do. 7 p.c.	10	12–13	..	5 15 4
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	108–110	+1	4 10 11
100,000	20	14 June	8	Bahia, Limited	20	9½–10¼*	..	15 3 10
200,000	5	11 May	6½	Bombay, Limited	5	5¾–5¾	..	5 13 0
40,000	5	,,	6½	Do. New	4	4–4¼	..	5 15 6
380,000	Stck.	28 Feb.	11½	Brentford Consolidated	100	223–228	..	5 0 10
180,000	,,	,,	8½	Do. New	100	168–173	..	4 18 3
220,000	Stck.	15 Mar.	11½	Brighton & Hove Original	100	210–215	..	5 6 11
888,500	Stck.	28 Feb.	5	Bristol	100	110–113	+1	4 8 6
320,000	20	29 Mar.	11½	British	20	45–47	..	4 15 10
50,000	10	28 Feb.	11½	Bromley, Ordinary 10 p. c.	10	21–22	..	5 4 7
51,510	10	,,	8½	Do. 7 p. c.	10	16–17	..	5 0 0
328,750	10	28 July	2	Buenos Ayres (New) Limited	10	5½–6	+¼	3 6 8
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	101–103	+½	5 16 7
150,000	20	28 Feb.	8	Cagliari, Limited	20	26–27	..	5 18 6
550,000	Stck.	12 Apl.	12½	Commercial, Old Stock	100	257–262	+4	4 15 5
165,000	,,	,,	9½	Do. New do.	100	190–195	..	4 17 5
160,762	,,	14 June	4½	Do. 4½ p c. Deb. do.	100	130–135*	..	3 6 8
800,000	Stck.	14 June	13	Continental Union Limited	100	235–240*	..	5 8 4
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	205–210*	..	4 15 3
535,000	Stck.	28 Feb.	5	Crystal Palace Ord. 5 p.c. Stk	100	105–110	..	4 10 11
486,090	10	31 Jan.	11†	European, Limited	10	23½–24½	+½	4 9 10
354,060	10	,,	11†	Do. Partly paid	7½	16–17	..	4 17 1
5,646,590	Stck.	14 Feb.	12	Gaslight & Coke, A, Ordinary	100	232–236	+½	5 1 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100–104	..	3 16 11
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	275–280	..	3 11 5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130–135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	190–195	..	3 16 11
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	177–182	..	3 16 11
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	272–277	..	3 12 3
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	167–172	+2	3 9 9
1,061,150	,,	14 June	4	Do. 4 p. c. Deb. Stk.	100	127–130*	..	3 1 6
894,850	,,	,,	4½	Do. 4½ p. c. do.	100	130–135*	..	3 6 8
908,000	,,	,,	6	Do. 6 p. c. do	100	175–180*	..	3 6 8
3,800,000	Stck.	11 May	12	Imperial Continental	100	213–218	..	5 10 1
75,000	5	14 June	6	Malta & Mediterranean, Ltd.	5	4½–5*	..	6 0 0
560,000	100	2 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	100	109–111	..	4 10 1
541,920	20	14 June	5	Monte Video, Limited	20	13¼–14¼*	..	6 18 0
150,000	5	30 May	8	Oriental, Limited	5	5¾–6¼	..	6 8 0
60,000	5	29 Mar.	7	Ottoman, Limited	5	3¾–4¼	..	7 7 4
166,870	10	31 Jan.	2	Pará Limited	10	1½–2	..	10 0 0
420,000	100	2 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	102–107	..	5 12 1
500,000	100	1 June	6	and Do.	100	95–100	..	5 0 0
150,000	10	26 Apl.	6	San Paulo, Limited	10	9½–10¼	..	5 14 3
500,000	Stck.	28 Feb.	15½	South Metropolitan, A Stock	100	317–322	..	4 16 3
1,350,000	,,	,,	12	Do. B do.	100	263–267	..	4 9 11
260,000	,,	,,	13	Do. C do.	100	270–275	+3	4 14 6
750,000	,,	17 Jan.	5	Do. 5 p. c. Deb. Stk.	100	153–157	..	3 3 8
60,000	Stck.	28 Feb.	11½	Tottenham & Edm'nton, "A"	100	210–215	..	5 7 0
				WATER COMPANIES.				
746,011	Stck.	29 Dec.	10	Chelsea, Ordinary	100	277–282	..	3 10 11
1,720,252	Stck.	12 Apl.	8	East London, Ordinary	100	225–230	..	3 9 7
544,440	,,	29 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	147–150	..	3 0 0
700,000	50	14 June	8½	Grand Junction	50	116–120*	..	3 10 10
708,000	Stck.	28 Feb.	11½	Kent	100	295–300	+2	3 16 8
1,043,800	100	29 Dec.	9½	Lambeth, 10 p. c. max.	100	258–263	+1	3 12 3
406,200	100	,,	7½	Do. 7½ p. c. max.	100	205–210	..	3 11 5
330,000	Stck.	29 Mar.	4	Do. 4 p. c. Deb. Stk.	100	132–135	..	2 19 3
500,000	100	14 Feb.	12½	New River, New Shares	100	367–372	..	3 5 2
1,000,000	Stck.	31 Jan.	4	Do. 4 p. c. Deb. Stk	100	134–137	..	2 18 4
902,300	Stck.	14 June	6	S'thwk & V'xhall, 10 p. c. max.	100	163–168*	..	3 11 5
126,500	100	,,	6	Do. D 7½ p. c. do.	100	147–150*	..	4 0 0
1,155,066	Stck.	14 June	10	West Middlesex	100	267–272* *Ex div.	..	3 13 7

† Next dividend will be at this rate.

Incandescent Gas Light Company, Limited.—In the report to be presented at the seventh annual meeting of this Company, to be held next Thursday, the Directors state that the business has increased fourfold, and that the profits have not been due to sales of patents, as some shareholders thought. In the year ending the 31st of March last, 105,000 lamps were sold, of which upwards of 90,000 were sent out between October and March; while in the preceding year only about 20,000 were disposed of. The increase in the business made it necessary to provide additional working capital; and therefore the Directors created £15,000 of 6 per cent. debentures, of which about £3000 have been taken up. The remainder are to be offered to the shareholders. The accounts accompanying the report show a profit of £23,072, out of which the Directors recommend the distribution of £10,349, free of income-tax. Of this sum the preference shareholders will, according to the Articles of Association, receive nine-tenths, amounting to £9314; and the ordinary shareholders one-tenth, amounting to £1035. This represents a dividend of £1 on each preference share, and 6d. on each ordinary share; the indivisible balance of £41 on the latter being carried forward to the credit of these shares. After paying the above amount, there will be a balance of £12,723. The Directors would therefore have been justified in recommending double the dividend recommended; but, taking into consideration the rapid extension of the business, they deem it advisable to retain it for the further development of the undertaking in the current year.

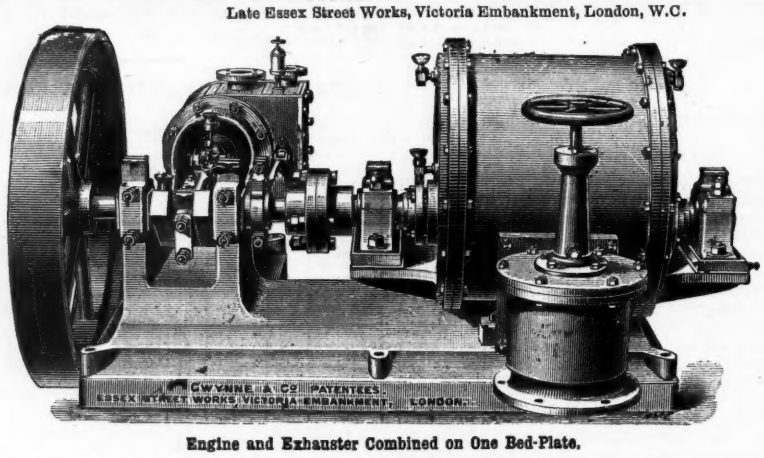
Exhibitions of Gas Appliances.—From the 19th to the 22nd inst., the Davis Gas-Stove Company, Limited, held exhibitions in the Albert Room, East Cowes, and at Malvern Link, under the auspices of the Gas Companies. Mrs. Hunter gave lectures at the former, and Mrs. Springthorpe at the latter place. At East Cowes, the room was lighted with a "Meteor" high-power gas-lamp, and one incandescent gas-light, also with six of Sugg's "Christiania" burners and decorated globes.——In conjunction with Messrs. John Wright and Co., Limited, Messrs. W. Parkinson and Co., held an exhibition of gas appliances last week in the Town Hall, Stone; Miss S. Thwaites giving cookery lectures. The Manager of the Gas Company (Mr. J. Gundry) co-operated in carrying out the arrangements. Messrs. Parkinson also held exhibitions at Chipping Norton and Stow-on-the-Wold, with Miss Sanderson's as lecturer.——Under the auspices of the Littlehampton Gas Company, Messrs. C. Wilson and Son, of Leeds, held an exhibition of their gas cooking and heating appliances in the Jubilee Hall, Littlehampton, last week; Miss Garstin lecturing on cookery. In addition to the stove exhibits, there was a good collection of meters, both ordinary and automatic prepayment; the whole being effectively arranged by the Company's Manager (Mr. W. Waite).——Successful gas exhibitions have been held during the past fortnight by Messrs. Fletcher, Russell, and Co., at Risca (Mon.) and Pembroke. Lectures were delivered daily by Miss Silcox. This week they will hold a similar exhibition at Pembroke Dock.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON." **GWYNNE & CO.,** TELEPHONE No. 2698.

HYDRAULIC AND GAS ENGINEERS, BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late Essex Street Works, Victoria Embankment, London, W.C.



Engine and Exhauster Combined on One Bed-Plate.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 80,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent. All communications *re* OXIDE to be addressed to PALMERSTON BUILDINGS, E.C.

BRIN'S Oxygen Company, Limited, Westminster. ANDREW STEPHENSON, Agent.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 200 British Gas-Works. [See Advt., p. 1147.]
ANDREW STEPHENSON, 182, Gresham House, Old Broad Street, LONDON, E.C. Telegrams: "Volcanism, London."

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and adroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."

JAMES LAWRIE & Co. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 1206 of this Week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

ALWAYS a Buyer of Spent Oxide, Tar and AMMONIACAL LIQUOR.
Apply to J. HARDMAN, Milton, STAFFORDSHIRE.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality, Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

TO INVENTORS AND OTHERS.

PATENTS for Inventions Secured and TRADE MARKS REGISTERED throughout the World. Advice on all matters connected with the above. Handbook gratis on application.
J. C. CHAPMAN, C.E., Chartered Patent Agent, 70, Chancery Lane, LONDON.

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND CO., Ammonia Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND CO., Tar Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND CO., Chemical Manufacturers, BIRMINGHAM, LEEDS, and WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759
GAS PLANT CEMENT
FOR ALL LEAKAGES.

WANTED, by the Advertiser (age 31), a Situation as METER INSPECTOR and FIXER, STOVE FITTER, TINMAN, &c. Good testimonials.
Apply to E. H. R., 4, South Terrace, HASTINGS.

WANTED, by the Son of a Gas and Water Works Manager (age about 20), a Situation as ASSISTANT. Has had five years' practical experience with both Companies.
Apply to W. A. ROPER, Water-Works, RICKMANSWORTH.

WANTED, by a Vienna Firm, having a large connection, the AGENCY (or the Sale on Commission) of MANUFACTORIES of GAS and WATER SUPPLY ARTICLES, of STEAM ARMATURES, and similar Goods.
Address offers to B.L. 1470, care of Mr. Otto Maass, VIENNA, I. (AUSTRIA).

GAS COAL AND CANNEL.

A GENTLEMAN (at present Manager of a well-known Firm in London of Gas Cannel and Steam Coal Merchants and Exporters), with a large and valuable connection among Gas-Works and the principal buyers at home and abroad, desires a SIMILAR POSITION with an established and first-class House already engaged in this business, or willing to add such a department to their existing Coal or Colliery Business.
Please reply to No. 2401, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, a good Gas- FITTER, used to Iron and Compo., able to lay Mains and Services, and fix Meters and Stoves.
Apply, stating age and wages expected, with *copies* of recent testimonials as to experience and steadiness, to JOHN SMITH, Gas-Works, BANGOR.

BRENTFORD GAS COMPANY.

WANTED, by the Brentford Gas Com- pany, an OUTDOOR INSPECTOR. Salary to commence at £150 per annum.
Applications, stating age and experience, with Testimonials, to be sent, addressed to the Directors, to the Company's Offices, not later than Thursday, July 19, endorsed "District Inspector."
By order.
Gas Offices: High Street, Brentford.

GORING and Streatley District Gas and Water Company, Limited, require the services of a young, active MAN to take ENTIRE CHARGE of the WORKS and DISTRICT, make out Accounts, and collect the same.
For further Particulars, apply to Mr. H. J. Robus, 20, Bucklersbury, London, E.C.
Applications to be sent to the Secretary, 5, Great Winchester Street, Old Broad Street, E.C., on or before July 4.
W. H. HARDY,
Secretary.
June 25, 1894.

WANTED, Two 8 to 10 Ton Railway TAR-TANKS.
State Particulars to No. 2404, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating price per ton and quantity, No. 2390, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Four Second-hand Purifiers, 6 ft. square, with Centre-Valve. May be disposed of singly if required.
Apply to the GAS MANAGER, RENFREW.

RETORT Mouthpieces and Lids, with mounting, Ω-shaped, 15 in. by 13 in., in good condition; cheap.
Address BLAIRGOWRIE GAS COMPANY, LTD.

FOR SALE — The Plant of a Small Gas- Works, producing 2 millions annually. Storeage capacity, 8300 feet. Production discontinued.
Apply to Mr. J. MILLS, Old Windsor, BERKS.

FOR SALE—A Cast-Iron Tank, 65 feet diameter and 12 feet deep, in good condition, suitable for Gasholder, or Tar or Liquor Tank.
Apply to CONTRACTOR, 158, Walton Street, OXFORD.

FOR SALE, very cheap—Two Circular CAST-IRON TANKS, 7 feet diameter by 4 ft. 6 in. deep.
Address No. 2403, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Gasholder, 40 ft. by 14 ft.; also Two 12-inch FOUR-WAY COCKS, and Two 12-inch VALVES. All in good condition. Holder good for re-erection.
Apply to the GAS MANAGER, NEWTON-ON-AYR.

FOR SALE—Two small, 5 feet square, PURIFIERS, with 4-inch Valves and Connections; equal to new. One BEALE'S GAS EXHAUSTER, with 4-inch Connections, in very good repair. Six 16-inch round MOUTHPIECES, with 4-inch Ascension-Pipes, Bridge-Pipes, and other Connections. Also HYDRAULIC MAIN, and 4-inch upright CONDENSERS.
Apply to the MANAGER, Gas-Works, BROMYARD.

SIENCIL PLATES.

TO ENGINEERS AND ALL WHO DRAW PLANS.

TO BE SOLD, a magnificently executed Set for LETTERING PLANS, &c. The Set consists of TEN COMPLETE SETS of ALPHABETS, plain, shaded, and ornamental; FOUR SETS OF FIGURES in various Styles: and FIFTY PLATES of all the principal words used upon Engineering Drawings, including Scales, Points, Corners, &c., in a Mahogany Case, with Brushes. Price for the whole, 30s.
Apply to Mr. G. BAKER, 39, Mount Pleasant Road, Crouch Hill, FINSBURY PARK, N.

AMMONIA SATURATORS.

TO GAS ENGINEERS, SULPHATE OF AMMONIA MANUFACTURERS, ETC.

MESSRS. W. THOMASON AND SONS, Chemical Plumbers, Lead Burners, &c., 21, WESTON STREET, BOLTON, beg to call the attention of Gas Engineers and others to the fact that, having laid down New Plant of the most modern construction, they have now the most complete and best adapted Premises in Lancashire for the Manufacture of LEAD SATURATORS and all kinds of CHEMICAL PLUMBING, and will be pleased TO QUOTE for any kind of LEAD WORK or REPAIRS of any description. By employing first-class Chemical Plumbers only, they can guarantee to give satisfaction to any orders entrusted to them.
Messrs. W. THOMASON AND SONS have on hand, ready for delivery, a Solid Plate Lead Saturator, 5 ft. by 4 ft. by 4 ft., made from 1-inch Lead Plates for the sides and midfeather, and 1½-inch Lead Plates for the top and bottom, burned solidly together by an improved process; and they invite inspection of the same by Gas Engineers or others interested.
Please write for an Estimate before ordering elsewhere. Lead Burners sent out to repairs.

MORECAMBE GAS AND LIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company are prepared to receive TENDERS for the supply of 3000 tons per annum of screened GAS COAL, to be delivered on the Gas-Works Siding, Midland Railway, Morecambe, in such quantities as may be required during a period of One, Two, or Three Years.
Tenders, specifying the description of Coal, the name of the pit at which it is raised, and the terms for net monthly payments, are to be sent in on or before Tuesday, the 26th of June, 1894, endorsed "Tender for Coal."
WILLIAM DUFF,
Secretary and Manager.
Market Street, Morecambe,
June 11, 1894.

BOROUGH OF BURTON-UPON-TRENT.

TAR.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS for the purchase of the surplus TAR to be produced at their Works during Twelve Months from the end of July next.
Probable quantity of Coal carbonized during the Twelve Months, 25,000 tons.
The Tar will be delivered free into Contractor's Tank-Trucks, on the Gas-Works Railway Siding.
Payments: Net Cash, Monthly.
Tenders, sealed, and endorsed "Tender for Tar," are to be delivered to me, at or before Ten a.m., on Friday, the 29th of June inst.
The highest or any tender will not necessarily be accepted.
F. L. RAMSDEN,
Manager and Engineer.
Gas and Electric Light Works,
Burton-upon-Trent, June 8, 1894.

COUNTY BOROUGH OF BRADFORD.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas and Electricity Supply Com- mittee of the Bradford Corporation are prepared to receive TENDERS for the supply of best GAS COAL, COBBLES, NUTS, and CANNEL, all to be well-screened, dressed, and free from Shale and Pyrites, to be delivered at the several Works of the Corporation in the Borough during the period of One Year or of Two Years, commencing on the 1st day of August next, as may be agreed upon.
Form of Tender, with any further Information required, may be had on application to Mr. Wood, Gas Engineer, Town Hall.
Sealed tenders, endorsed "Tender for Coal," to be sent to me on or before Thursday, the 5th of July next.
An assurance must be given by each contractor that he pays to the workmen employed by him not less than the minimum standard rate of wages.
The Committee do not bind themselves to accept the lowest or any tender.
By order,
W. T. M'GOWEN,
Town Clerk.
Town Hall, Bradford,
June 22, 1894.

COLNE LOCAL BOARD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of from 7000 to 9000 tons of GAS COALS during the next Twelve Months.
Forms of Tender and any further Information can be obtained from the undersigned, to whom tenders must be sent on or before the 7th of July, 1894.
HY. SIMMONDS,
Engineer and Manager.
Gas-Works, Colne,
June 19, 1894.

TO COAL CONTRACTORS AND OTHERS.

THE Sedgley Local Board invite Tenders for supplying 500 to 1000 tons of GAS COAL; the deliveries to be at Shut-End Siding, at such times and in such quantities as may be directed.
Sealed tenders, marked "Gas Coal," to reach me on or before the 5th of July next.
The Board do not bind themselves to accept the lowest or any tender.
JOSEPH SMITH,
Clerk.
Offices: High Holborn, Sedgley,
June 16, 1894.

PENRITH LOCAL BOARD.

THE Gas Committee are prepared to receive TENDERS for ADDITIONS to RETORT-BENCH, comprising one through Arch for two Beds of seven Retorts, with all Ironwork to complete.
Plans and Specifications may be seen on application at the Works.
Endorsed tenders to be delivered to the Chairman of the Gas Committee by Wednesday, July 4.
E. SHAUL,
Manager.
Gas-Works, Penrith,
June 16, 1894.

NORTHWICH GAS COMPANY.

TENDERS are invited for the supply and delivery at Northwich Railway Station of about 3300 tons of GAS COAL and 200 tons of CANNEL during the ensuing Twelve Months.
TENDERS are also invited for the supply and delivery of LIME and SULPHURIC ACID during the same period.
Any further Particulars required may be had on application to Mr. S. S. Mellor, Manager.
Tenders, endorsed and addressed to the Chairman, must be delivered here not later than the 6th of July next.
HY. PICKERING,
Secretary.
Gas-Works, Northwich,
June 21, 1894.

WEST MALLING GAS COMPANY.

TENDERS FOR GAS COAL.

TENDERS are invited for the supply of about 550 tons (more or less) of PELTON MAIN or any other class of really good GAS COAL, to be delivered at the Company's Works, West Malling, between the 29th of September, 1894, and the 29th of September, 1895, in quantities of not more than 60 tons a month.
The name and quality of the Coal to be specified in the tender.
Sealed tenders, endorsed "Tenders for Coal," to be forwarded to me on or before the 16th of July next.
The Directors do not pledge themselves to accept the lowest or any tender.
By order,
HENRY D. WILDES,
Secretary.
West Malling, June 18, 1894.

MUNICIPALITY OF BAHIA (BRAZIL).

TO COLLIERY PROPRIETORS.

THE undersigned Agents for the Bahia Municipality are prepared to receive TENDERS for 4000 tons of DURHAM GAS COAL and 1200 tons of CANNEL, to be delivered one-half during the months of November and December, 1894, and January, 1895, and one-half during the months of August, September, and October, 1895, as required by purchasers.
Cargoes to be delivered f.o.b. export ship, and to be paid for in cash against shipping documents.
Tenders must be delivered to the undersigned not later than the 30th of June, 1894.
The Municipality do not bind themselves to accept the lowest or any tender.
FRY, MIERS, AND CO.,
Agents for the said Municipality.
Suffolk House, Laurence Pountney Hill,
London, E.C.

COUNTY BOROUGH OF STOCKPORT.
(GAS DEPARTMENT.)

TO COLLIERY OWNERS AND OTHERS.

THE Gas Committee are prepared to receive TENDERS for the supply of CANNEL and COAL for a period of One, Two, or Three Years, deliveries to commence on the 1st of September next to the 30th of June, 1895, for the first Year, and from July to June 30 in the following Years.
Particulars as to quantity and conditions of contract may be obtained on application to the Engineer, Mr. S. Meunier, Stockport.
No Form of Tender other than that issued by the Committee will be entertained.
Tenders, stating price per ton delivered at the Portwood Drops, Stockport, endorsed "Tender for Cannel" or "Coal," and addressed to the Chairman of the Gas Committee, must be sent in on or before the 4th day of July next.
No tender will be accepted without satisfactory proof that the firm tendering pay the standard rate of Wages and observe the standard number of Hours; and the Committee reserve the right to accept for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any tender.
By order,
WALTER HYDE,
Town Clerk.
June 21, 1894.

GAS COAL.

THE Directors of the Oakham Gas Company, Limited, invite TENDERS for about 600 tons of good GAS COAL.

For Particulars and Forms of Tender, apply to

JAS. MASON,
Manager.

THE WALLINGFORD GASLIGHT AND COKE COMPANY, LIMITED.

TENDERS FOR GAS COAL.

THE Wallingford Gaslight and Coke Company, Limited, invite TENDERS for the supply for One Year, from the 13th of August next, of about 900 tons of best screened GAS COAL, to be delivered free, at the Railway Station at Wallingford, in such quantities and at such times as the Company may require.

Payments monthly.

Sealed tenders, endorsed "Tender for Gas Coal," to be delivered on or before the 31st of July next.

The Company do not bind themselves to accept the lowest or any tender.

By order,
JOHN CARTHEW,
Secretary.

Wallingford, June 23, 1894.

CITY OF HEREFORD.

THE Gas Management Committee of the Corporation invite TENDERS for the supply of best screened large GAS COAL for One Year, from the 1st of August next, to be delivered free at the Gas-Works Siding, Hereford, in such quantities as may be required from time to time.

The estimated quantity required will be about 8000 tons.

Full Particulars and printed Forms of Tender may be obtained on application to the undersigned.

Tenders, endorsed "Tender for Gas Coal," are to be sent in, addressed to the Chairman, Gas Management Committee, Mansion House, Hereford, by Saturday, July 7.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
WILLIAM PARLBY,
Gas Engineer and Manager.

Gas-Works, Hereford,
June 18, 1894.

LURGAN GASLIGHT & CHEMICAL COMPANY, LIMITED.

COAL WANTED.

THE Directors invite Tenders for the supply of 2500 tons of best (screened) GAS COAL, delivered into Lighters *ex*-ship at Belfast, free of all charges.

Delivery of 2000 tons will be taken before the 1st of November next; the remainder to be delivered at such times, before the 1st of April, 1895, as may be required.

Vessels carrying from 200 to 300 tons can at once deliver into Lighters; and these Lighters be back for a further cargo within a period to be arranged and agreed upon by the Gas Company.

Tenders (in sealed envelope), accompanied by reference to Gas-Works using the Coal offered, should reach me not later than Ten o'clock in the Forenoon of Monday, the 2nd of July, 1894.

The Directors do not bind themselves to accept the lowest or any tender.

FRED. W. MAGAHAN,
Secretary.

Gas-Works, Lurgan,
June 14, 1894.

BOROUGH OF BEVERLEY.

TENDERS FOR COAL.

THE Gas Committee are desirous to receive TENDERS for the supply of COAL, for periods of Six and Twelve Months respectively, from the 1st of August next; to be delivered as from time to time directed by, and at the expense of, the Contractors, f.o.b. at Keadby, or at the Pits, or at the Railway Station, Beverley, according to the Terms of Contract.

The Coal to be of the best kind, well screened, free from Sulphur, Bats, Bind, Refuse, and Dirt, and to be weighed (20 cwt. to the ton) upon the Corporation Machine.

Payments will be made monthly, so long as the Contract shall be duly fulfilled.

The Corporation do not bind themselves to accept the lowest or any tender.

Further Information may be obtained of the Gas Manager, Mr. James Gibson, at the Gas-Works, Beverley; and tenders, endorsed "Tender for Coal," must be delivered at my Office not later than Ten a.m., on Thursday, the 28th inst.

By order,
JAMES MILLS,
Town Clerk.

Guildhall, Beverley,
June 11, 1894.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to CAPITAL STOCKS, WILL BE CLOSED at Four o'clock p.m., on Tuesday, the 3rd day of July next, and will be re-opened immediately after the Half-Yearly General Meeting of the Company, to be held in the Month of August next.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., June 23, 1894.

HOLMSIDE GAS COALS.
(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

Just published.
With numerous Illustrations and Tables, crown 8vo. cloth, 6s.

THE
GAS ENGINEER'S LABORATORY HANDBOOK,
By JOHN HORNBY, F.I.C.
Honours Medallist in Gas Manufacture, City and Guilds of London Institute.

LONDON: E. & F. N. SPON, 125, Strand.
NEW YORK: 12, Cortlandt Street.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
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These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
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Strongly recommended where EXCESSIVE HEATS have to be maintained.

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Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

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Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Bombay Gas Company, Ipswich Gaslight Company, Devonport Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

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Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

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Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
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YIELD OF GAS PER TON	10,375 CUBIC FEET.
ILLUMINATING POWER	17·50 SPERM CANDLES.
COKE	75 PER CENT.

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Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
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Tudhoe Gas-Works,
Spennymoor,
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Messrs. The

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Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.
The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

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ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

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Analysis: 12,600 feet of 19-candle gas per ton.

Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

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Specially prepared Benzole for fortifying Gas, **10d. (tenpence) per gallon** f.o.r. in Tank-Trucks, or in Casks One Penny per Gallon extra.

Costs only One-Third of a Penny per Candle.

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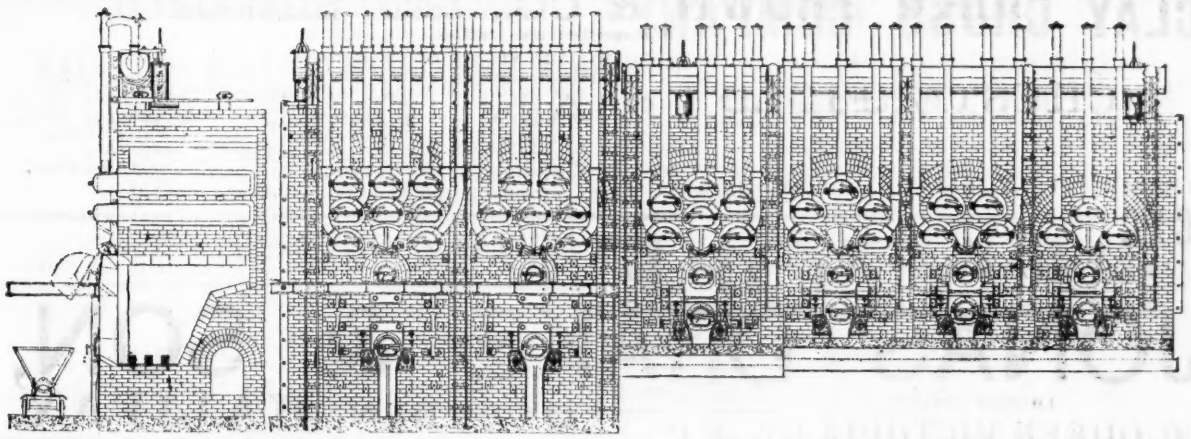
HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS, CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13 000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS, AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

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Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stuart Street, Shawlands, Glasgow; J. E. FISHER, Stourbridge; JOHN WALSH & SONS, Retort Builders, Halifax, Yorkshire; RICHARD TURNER, Retort Builder, Denton, Lancashire; and from the Principal Agent, R. F. HISLOP (son of Patentee), Gas-Works, Paisley, N.B.

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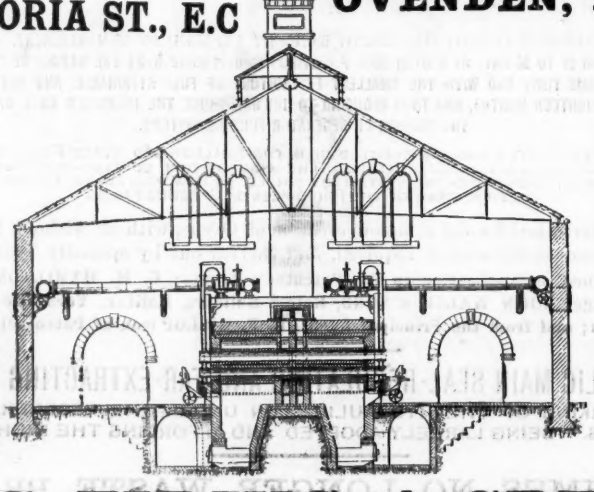

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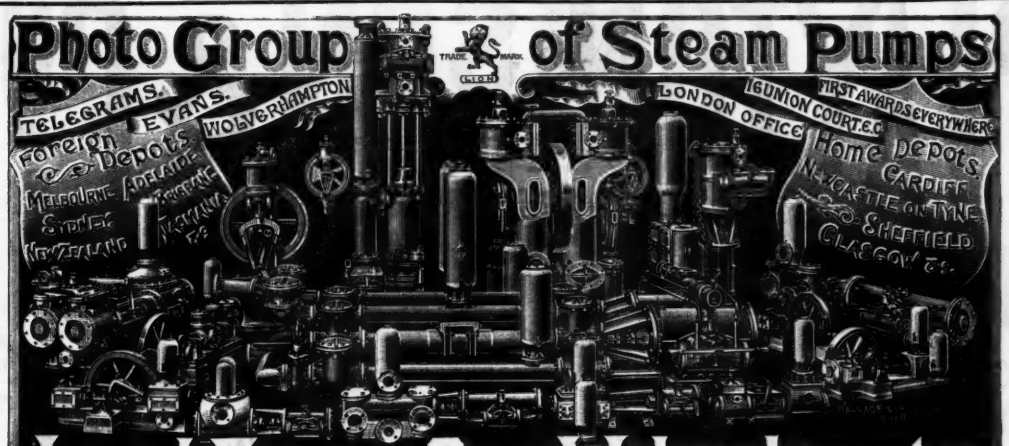

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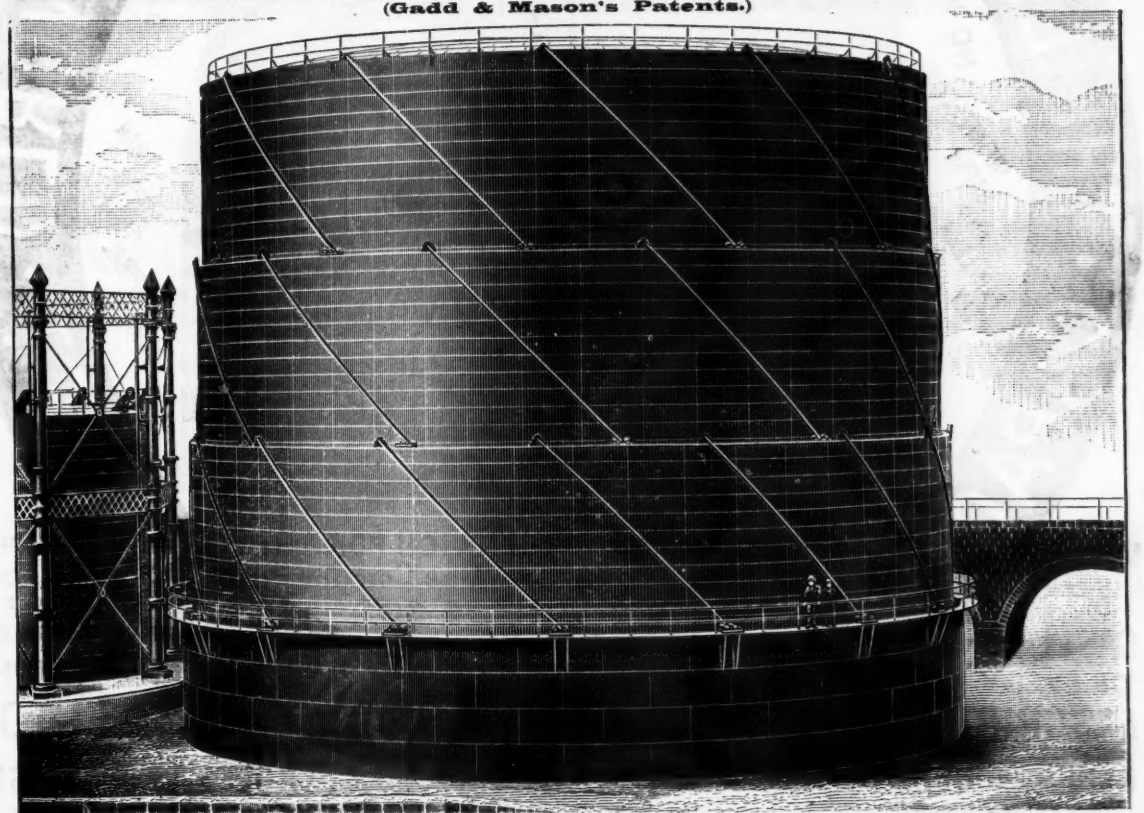

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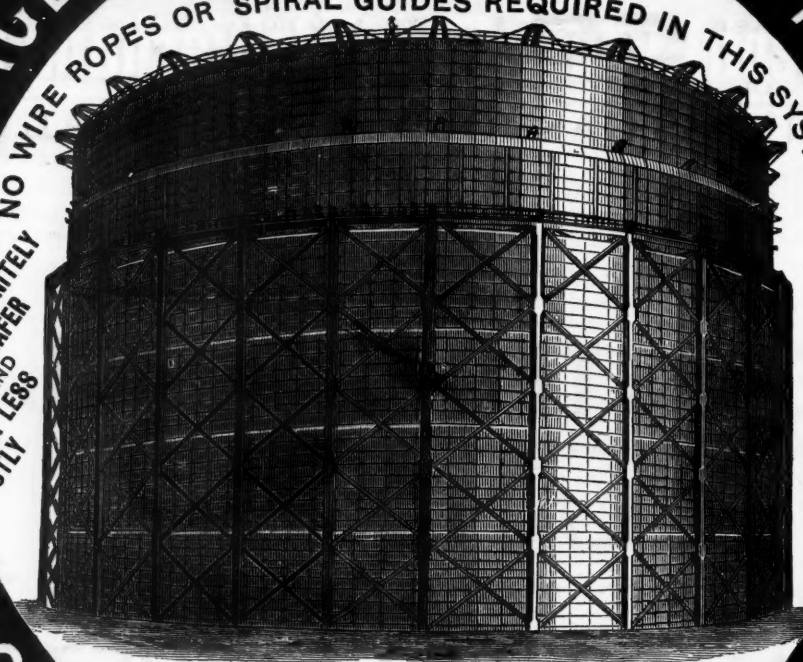

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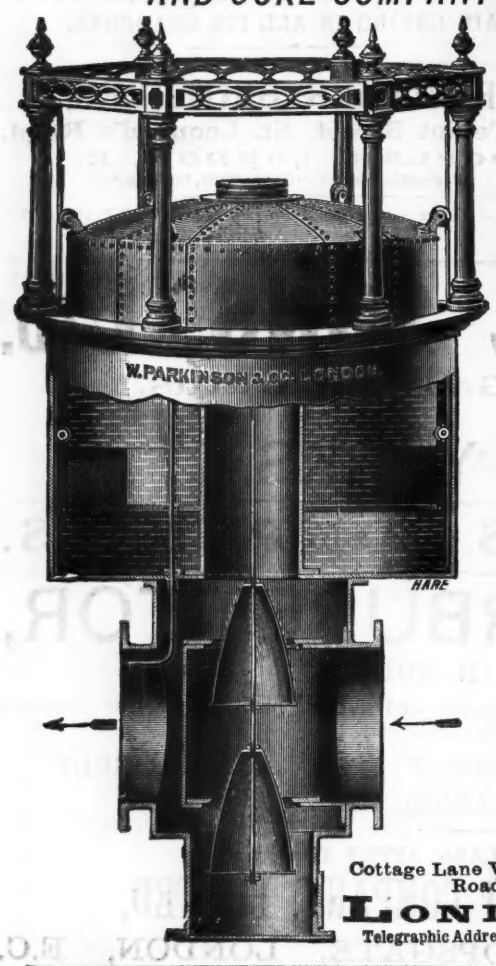

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[See Advt. p. 1210.

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